PLAN Series™

Network Installation
Reference Manual

NESTAR

NESTAR SYSTEMS, INCORPORATED

PLAN SERIES™

NETWORK INSTALLATION REFERENCE MANUAL

DISCLAIMER OF WARRANTIES

Where to Find Information

This manual is an addendum to the "quick" installation guides (*PLAN 3000 Quick Installation Guide, PLAN 4000 Quick Installation Guide, PLAN 5000 Quick Installation Guide*). Other relevant documentation is described below.

For an overview of the system, read the *PLAN Series General Information Manual.*

To plan your installation in advance, see the *PLAN Series Physical Planning Manual.*

Once your system is installed, read the *PLAN Series File Server Installation and Operation Manual* for information on file server console commands and offline utilities.

See the *PLAN Series Network Command Reference Manual* for information on file server hard disk file naming conventions, network security, and network commands that can be issued from network workstations. PLAN Series *User Guides* for Apple environments and *Reference Guides* for IBM environments describe workstation startup procedures, utilities, programming, and, in some cases, printing.

For problems of network installation or operation, see the *PLAN Series System Service Manual.*

The *PLAN Series General Index* indexes the contents of seven core PLAN Series manuals (the *General Information Manual,* the *Physical Planning Manual,* the *Print Server Installation and Operation Manual,* the *Network Command Reference Guide,* the *IBM PC DOS Reference Manual,* the *System Service Manual,* and this manual).

There is a bibliography of PLAN Series system manuals at the end of this manual.

How to Use This Manual

The *Quick Installation Guides* will direct you through system installation. The information in this manual is meant to address any technical questions that may arise at the time of installation.

The material in this document applies to Version 2 3 of the PLAN File Server software. Software upgrades are discussed in an Appendix of the *PLAN Series Network Command Reference Manual.*

We welcome criticisms and suggestions. Forms for reporting program errors and documentation errors or inadequacies are provided at the back of this manual.

Warning

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the manufacturer's instructions, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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Chapter 1

PLAN 3000

Hardware Installation Information

1.0 Introduction

This section presents hardware installation reference material that is not included in the *PLAN 3000 Quick Installation Guide.* Since actual installation does not require knowledge of this infor mation it is presented here for reference purposes.

1.1 Hardware Components

The PLAN 3000 File Server consists of file server hardware, the software that runs on it. and optionally a Print Server Feature Card.

See Figure 1-1 and 1-2 for a front and rear view of the file server cabinet

The file server cabinet contains two boards in a card cage: a CPU board and a Peripheral Interface Card (PIC).

A Print Server Feature Card may also be present or can be added later.

Another board, the disk/tape controller, is mounted above the card cage.

All internal hardware connections are completed before ship- ment; these connections are listed in Section 1.2.

Figure 1-1

PLAN 3000 File Server
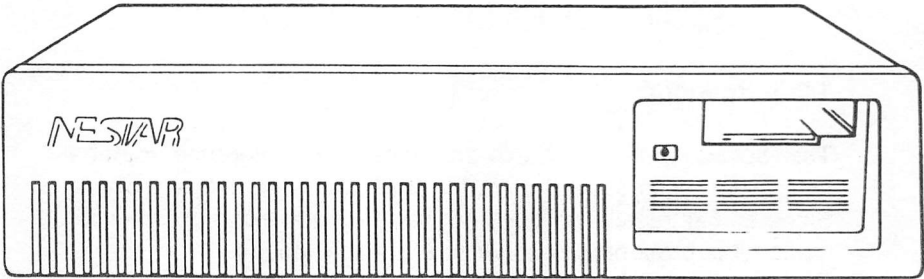
FRONT VIEW
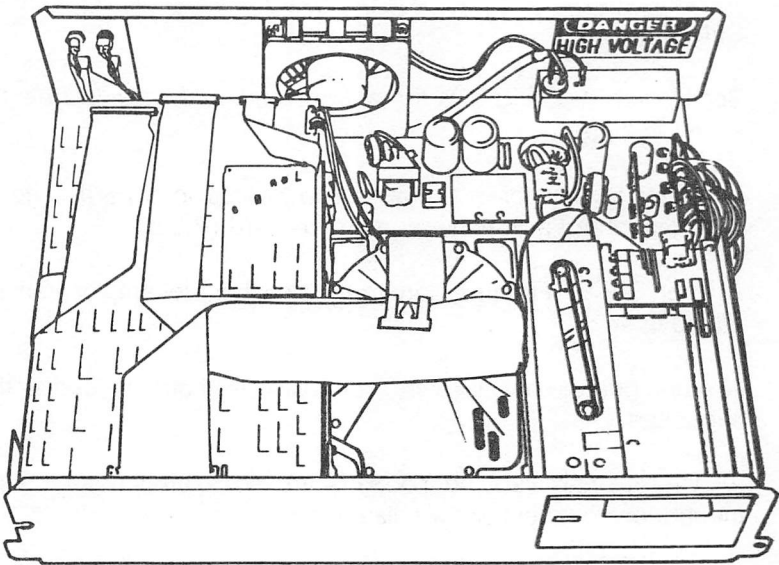
TOP VIEW
(COVER REMOVED)

Figure 1-2

**PLAN 3000 File Server
Rear View**
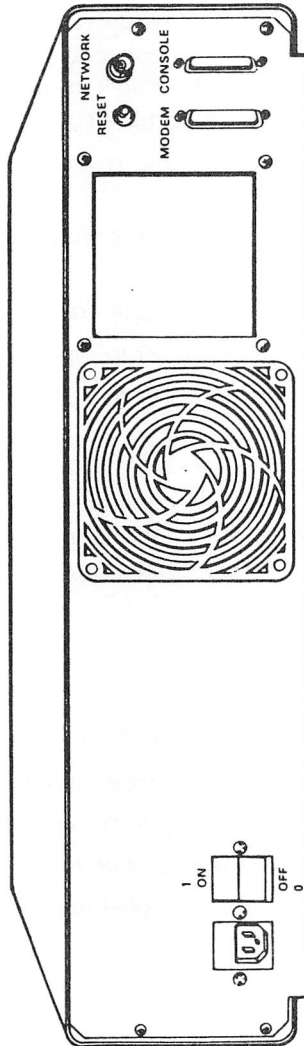
1.2 Internal Cabling

This section lists the connections between cards (boards) and to the server back panel (see Figure 1-3).

1.2.1 Logic

a. CPU card - one 50 pin ribbon cable going to two RS232 ports on back panel (cable is split in rear). The CPU card is located <u>below</u> the PIC card in the card cage.

b. PIC card – twisted pair cable to back panel network connector.

c. PIC card – connection to reset button on back of server cabinet.

d. PIC card – cable to the disk/tape controller.

e. Cable from disk/tape controller to tape drive.

f. Cable from disk/tape controller to 5.25" disk.

g. Print Server Feature Card cables per card: one 50 pin ribbon cable to two D connector parallel ports; one 26 pin cable to an RS232 port on the back panel; one twisted-pair 4 pin connector to the back panel reset button. three twisted-pair internal HUB cable ports.

1.2.2 DC Connections

a. Connection of 5.25" hard disk drive to power supply.

b. Connection of tape drive to power supply.

c. Connection of tape formatter to power supply.

d. Connection of card cage to power supply.

e. Connection of disk/tape controller to power supply.

Figure 1-3

Signal and Power Cables

TAPE DRIVE

40p FLAT
15' MAX

50p FLAT
15' MAX

DISK CONNECTOR
50 PIN

PIC

DISK/TAPE
CONTROLLER

50p FLAT
2' MAX

68000
CPU
256 RAM

DISK

D-25 IDC CONNECTORS
(RS 232): CONSOLE
AND MONITOR

RESET
BUTTON

SERVER
NETWORK
CONNECTOR
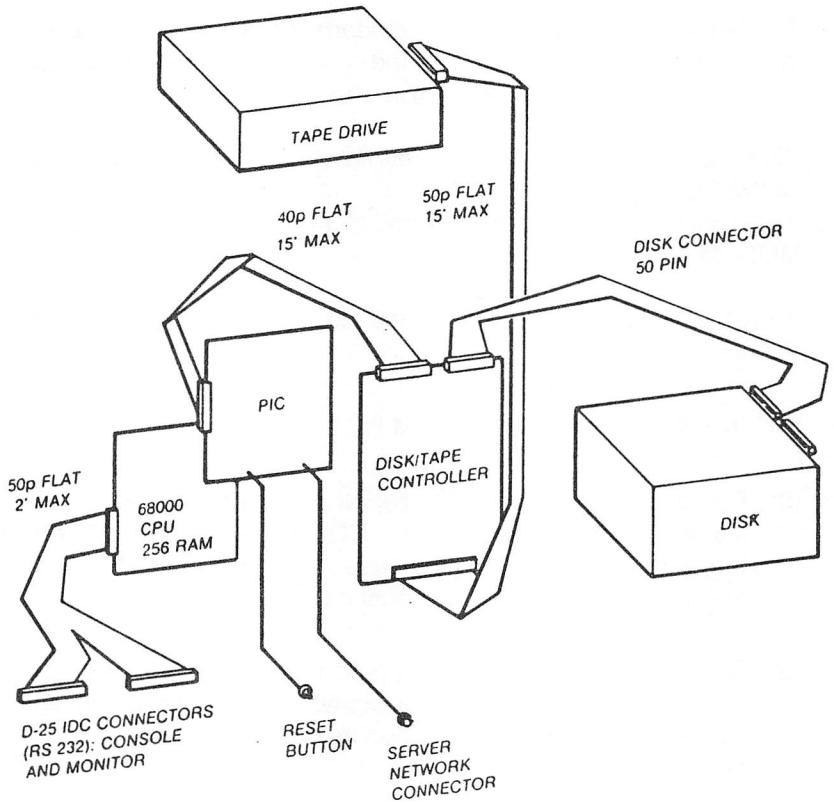
1.2.3 AC Connections

a. One cord from power socket to wall outlet.

b. Connection of power supply to AC power.

c. Connection of fan to AC power.

1.3 Connecting Terminals to the File Server Cabinet

The file server cabinet has two standard RS232 connector ports in the rear. File server console and terminal use are discussed in the *PLAN File Server Installation and Operation Manual.*

Plug the file server console. if any, into the RS232 port labeled CONSOLE on the back panel. If a remote terminal is to be used. plug in the modem cable to the RS232 port labeled MODEM on the back panel.

An IBM PC can also be used as the file server console, local or remote:

(1) Install a serial card in the IBM PC.

(2) For local use, cable the file server to the IBM PC using the file server RS232 port labeled CONSOLE and the jack on the serial card. For remote use, cable the IBM PC to a modem via the jack on the serial card.

(3) Run a terminal emulator program in the IBM PC. Set emulator program parameters as shown in the table of switch settings described in the section below.

1.3.1 The Console Port

Only Transmit Data, Receive Data, and Signal Ground are connected in the console port. The wiring is as follows·

Console Port RS232 pin	Signal	To/From Server
2	Receive data	To
3	Transmit data	From
7	Signal ground	Both

The console port is wired as data communications equipment. This is consistent with the wiring from most terminals, i.e., a 3-wire or more cable with corresponding pins connected should work correctly

The terminal must send data on pin 2 and receive data on pin 3. In addition, it must NOT depend on the presence of any other asserted control signals to operate. Any control signals must be provided by local jumpers at the terminal connector. The terminal should emulate a VT-52, ADDS Viewpoint, or Televideo 920 at 9600 baud. In addition, it can use XON/XOFF signaling to control the flow if it cannot keep up (except for a DEC VT-100 Series Terminal used in VT-52 mode).

1.3.2 Setting Terminal Switches

Before attaching your terminal to the file server, follow the terminal manufacturer instructions to set it up as follows:

TRANSMIT DATE RATE	9600
RECEIVE DATA RATE	9600
STOP BITS	1
PARITY ENABLE	ON
PARITY SENSE	EVEN
DATA LENGTH	7
DUPLEX	FULL
EOM CHAR	CR
XON/OFF	ON
AUTO LF/CR	OFF

Note: If a DEC VT-100 Ser·   ·erminal is used in VT-52 mode, disable XON/XOFF.

Examples:

ADDS Viewpoint switch settings

S1 -			3		5		7	8	up
	1	2		4		6			down

Esprit II switch settings

S1 -						6			9	10	up
	1	2	3	4	5		7	8			down

S2 ·			3	4					9		up
	1	2			5	6	7	8		10	down

1.4 Connecting Local and Remote Modems for Use with the File Server

Connect a modem to the file server cabinet using the RS232 connector labeled MODEM at the rear of the cabinet. Connect the modem to the phone lines according to the instructions in the modem's user manual (see below for modem switch settings).

Connect a modem at the remote site and issue the command "MODEM ON" from the console. "MODEM OFF" can be issued at the file server or at the remote site. See the *File Server Installation and Operation Manual*, Chapters 3 and 4, for MODEM ON/OFF information.

Transactions in this mode occur at a rate of 1200 baud even to the local console (which is normally 9600 baud) because of modem transmission speeds. This is only true while the phone connection is in effect; speed reverts to 9600 baud when the connection is broken (even if MODEM OFF is not issued).

1.4.1 The Modem Port

The wiring is as follows:

Modem Port RS232 pin	Signal	To/From Server
3	Xmit data	To
2	Rcv data	From
5 (unused)	CTS	To
4 (unused)	RTS	From
20	DTR	From
7	Signal ground	Both
6	DSR	To

The modem port is wired as data terminal equipment. This is consistent with the wiring for most modems i.e.. a 5-wire (or more) cable with corresponding pins connected should work correctly.

The modem must send data on pin 3 and receive data on pin 2. It should assert pin 6 when the modem is ready and maintain the phone connection as long as it sees pin 20 asserted. The modem should be able to transmit and receive at 1200 baud.

1.4.2 Setting Modem Switches

For remote and local use of the Hayes Smartmodem 1200, set the modem switches as follows:

1 Down
2 Up
3 Down
4 Up
5 Up
6 Down
7 Up
8 Down

For local (file server) use:

1 Down
2 Up
3 Up
4 Down
5 Up
6 Down
7 Up
8 Up

For other modems set the switches to

1200 baud
Full duplex
Autoanswer
DTR not supported by file server

Other modem switch settings are irrelevant for network use, and should be set to meet local phone use requirements.

Chapter 2

PLAN 4000

Hardware Installation Information

2.0 Introduction

This section presents hardware installation reference material that is not included in the *PLAN 4000 Quick Installation Guide*. Since actual installation does not require knowledge of this information it is presented here for reference purposes.

2.1 Hardware Components

The PLAN 4000 File Server consists of file server hardware software that runs on it, and optionally a Print Server Feature Card.

The file server will always consist of a cabinet labeled FILE SERVER; optionally, there may be cabinet(s) labeled STORAGE (see Figure 2-1 thru 2-2 for a front and rear view of the cabinets).

The file server cabinet may contain an 8" hard disk. If a larger 14" hard disk is desired, the disk resides in the storage cabinet.

The PLAN 4000 may consist of up to four hard disks (up to five cabinets, one 14" hard disk per storage cabinet when the file server does not contain a hard disk).

Two cabinets can be attached to each other to form one unit: this is done at the factory. When four cabinets are present, the first and second are connected, as are the third and fourth. The two two-cabinet units are linked by a logic cable attached at installation. (Logic or signal cables transmit digital information rather than AC or DC power.)

The file server cabinet contains two boards in a card cage: a CPU board and a Peripheral Interface Card (PIC).

A Print Server Feature Card may also be present, or can be added later.

Another board, the disk/tape controller, is located on the right-side wall of the file server cabinet, toward the rear.

All internal hardware connections are completed before ship-ment; these connections are listed in Section 2.2. If a third cabinet is present, or a third and fourth cabinet attached to each other, the third cabinet must be linked to the second via a logic cable.

Each file server cabinet has a slot at the bottom back of each side panel. When casters are attached, the slots are invisible. If cabinets are joined, the slots provide access from one cabinet to the next. Cables need not be routed out the back of one cabinet and into the back of the other. Instead, cables are run from the file server cabinet to the proper locations in the first storage cabinet, if present.

If cabinets are not bracketed together, the slots are not used and the cabinets are connected via a ribbon cable that plugs into the rear aux disk port of adjacent cabinets.

The serial and parallel ports on the rear of the file server cabinet are for use with network printers.

Figure 2-1

**PLAN 4000 File Server
Front View**
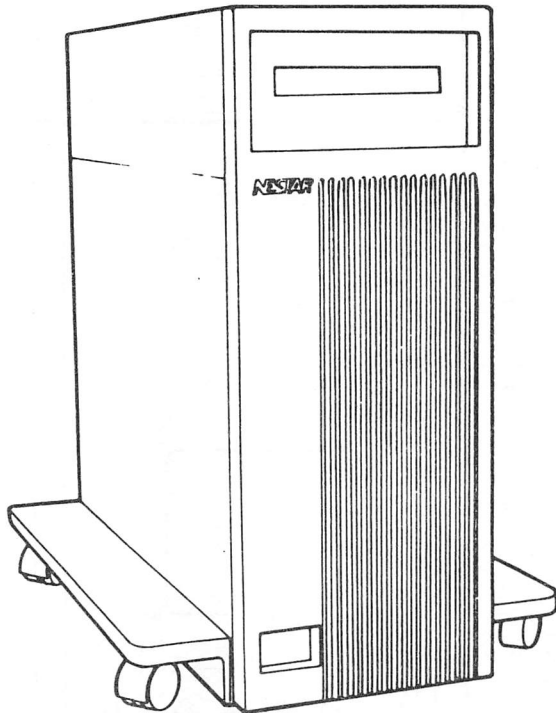
Figure 2-2

**PLAN 4000 File Server
Rear View**
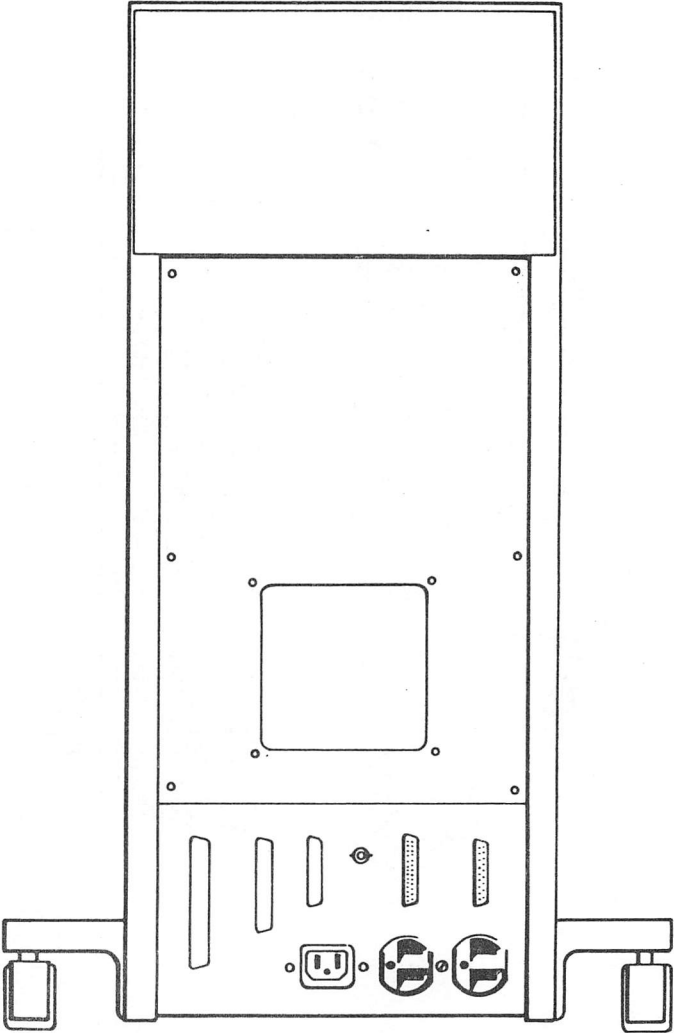
2.2 Internal Cabling

This section lists the connections between cards (boards) and to the server backpanel (see Figure 2-4).

2.2.1 Logic

a   CPU card – one 50 pin ribbon cable going to two RS232 ports on back panel (cable is split in rear).

b.   PIC card – twisted pair cable to back panel BNC (network port) or to Print Server Feature Card, if present.

c.   PIC card – connection to reset button on front of server box.

d.   PIC card – cable to the disk tape controller.

e   Cable from disk tape controller on top of bottom disk drive to tape drive

f   Cable from disk tape controller to first disk.

g.   Print Server Feature Card cables per card: one 50 pin ribbon cable to two D connector parallel ports: one 26 pin cable to an RS232 port on the back panel; one twisted-pair 4 pin connector to the back panel reset button; twisted pair to back panel BNC: twisted-pair to PIC (b. above).

2.2 2 DC Connections

Main power supply:

  – primary 8" hard disk
  – tape drive formatter
  – disk tape controller
  – multibus card cage
  – top DC fan
  – main drive DC fan

(Tape drive and 14" hard disk have built-in power supplies.)

Figure 2-3

Signal Cables

TAPE DRIVE

40p FLAT
15' MAX

50p FLAT
15' MAX

DISK CONNECTOR
50 PIN

PIC

DISK/TAPE
CONTROLLER

50p FLAT
2' MAX

68000
CPU
256 RAM

DISK

50p FLAT
15' MAX
DAISY
CHAIN

D-25 IDC CONNECTORS
(RS 232): CONSOLE
AND MONITOR

RESET
BUTTON

SERVER
NETWORK
CONNECTOR

DISK

STORAGE

FILE SERVER
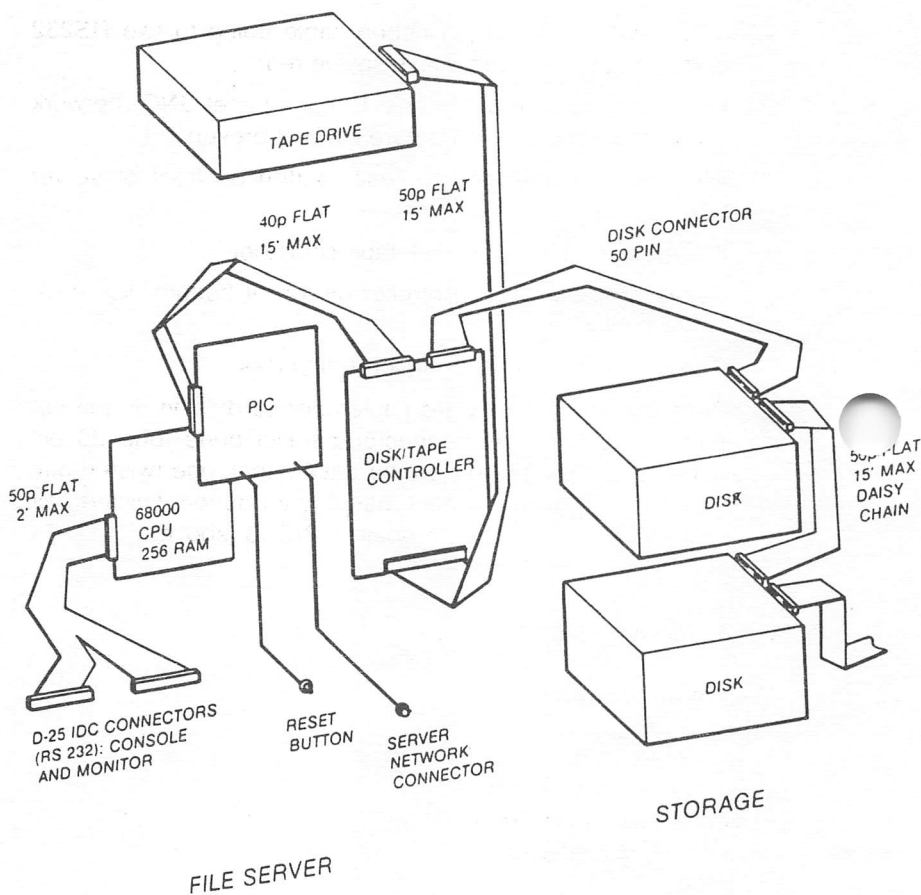
2.2.3 AC Connections

a. One cord from unit power socket to wall outlet.

b. Connections of main power supply to power input module (switch. filters. fuses).

c. if second drive is present power supply to main power supply AC

2.3 Cabling Unattached Cabinets Together

Standalone and factory connected cabinets require no cabling. If a third cabinet is present. or a third and fourth attached to each other. the third cabinet must be cabled to the second by plugging the 50 pin cable provided into the 50 pin connector on each cabinet in the AUX DISK port (Figure 2-4), and attaching the cable shield ground tab to the local cabinet ground connector.

Figure 2-4

Connecting Unattached Cabinets

SHIELDED CABLE
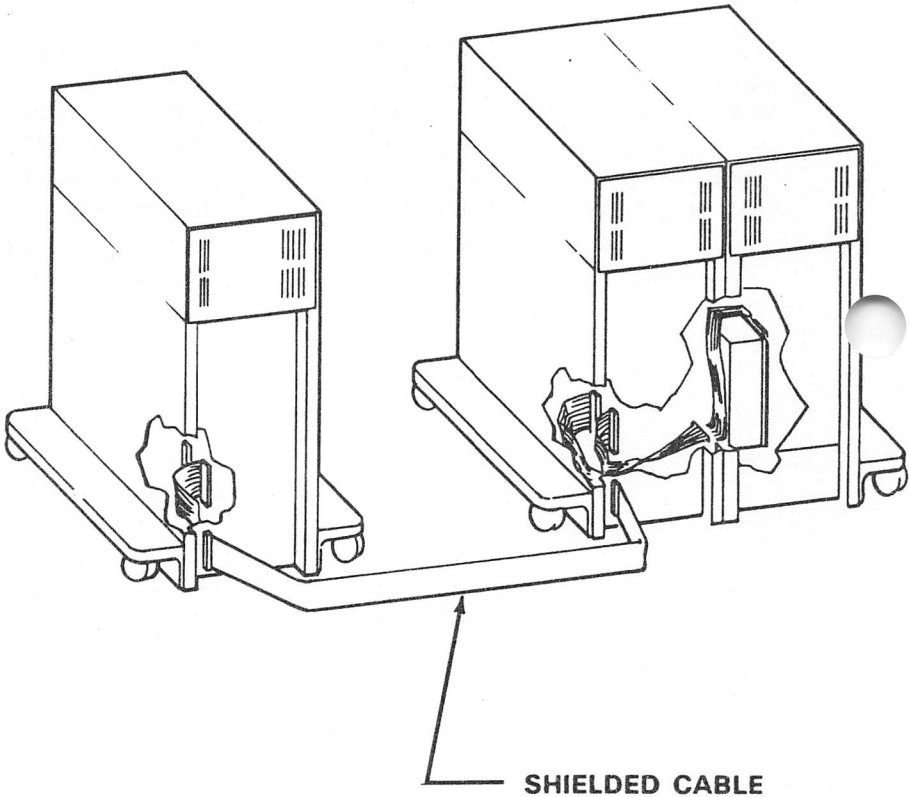
2.4 Connecting Terminals to the File Server Cabinet

The file server cabinet has two standard RS232 connector ports in the rear. Use of file server consoles and terminals is discussed in the *PLAN File Server Installation and Operation Manual*.

To connect a terminal or modem to the cabinet, simply attach the terminal or modem cable to the proper rear connector port. The cable used for both connections should be a straight 25 pin cable with male C connectors at both ends.

Plug the file server console, if any, into the RS232 port labeled CONSOLE on the back panel. If remote diagnostics are to be used, plug in the modem cable to the RS232 port labeled MODEM on the back panel. AC convenience outlets for terminal and modem are located on the back of the file server cabinet.

Nestar recommends obtaining a direct voice-grade phone line for use with remote diagnostics. Phone lines that pass through in-house PBXs are often too noisy for good data communications.

Console port RS232 pins and terminal switches are discussed in the following subsections.

An IBM PC can also be used as the file server console, local or remote.

(1) Install a serial card in the IBM PC.

(2) For local use, cable the file server to the IBM PC, using the file server RS232 port labeled CONSOLE and the jack on the serial card. For remote use, cable the the IBM PC to a modem via the jack on the serial card.

(3) Run a terminal emulator program in the IBM PC. Set emulator program parameters as shown in the table of switch settings below.

2.4.1 The Console Port

Only Transmit Data, Receive Data, and Signal Ground are connected in the console port. The wiring is as follows:

Console Port RS232 pin	Signal	To/From Server
2	Receive data	To
3	Transmit data	From
7	Signal ground	Both

The console port is wired as data communications equipment. This is consistent with the wiring from most terminals. i.e., a 3-wire or more cable with corresponding pins connected should work correctly.

The terminal must send data on pin 2 and receive data on pin 3. In addition, it must NOT depend on the presence of any other asserted control signals to operate. Any such control signals must be provided by local jumpers at the terminal connector. The terminal should emulate a VT-5, ADDS Viewpoint, or Televideo 920 at 9600 baud. In addition, it can use XON/XOFF signaling to control the flow if it cannot keep up (except for a DEC VT-100 Series Terminal used in VT-52 mode).

2.4.2 Setting Terminal Switches

Before attaching your terminal to the file server, follow the terminal manufacturer instructions to set it up as follows:

TRANSMIT DATE RATE	9600
RECEIVE DATA RATE	9600
STOP BITS	1
PARITY ENABLE	ON
PARITY SENSE	EVEN
DATA LENGTH	7
DUPLEX	FULL
EOM CHAR	CR
XON/OFF	ON
AUTO LF/CR	OFF

Note: If a DEC VT-100 Series terminal is used in VT-52 mode, disable XON/XOFF.

Examples:

ADDS Viewpoint switch settings

S1 -			3		5		7	8		up
	1	2		4		6				down

Esprit II switch settings

S1 -						6			. 9	10		up
	1	2	3	4	5		7	8				down

S2 -			3	4				9		up
	1	2			5	6	7	8	10	down

2.5 Connecting Local and Remote Modems for Use with the File Server

To issue commands to the file server or to use file server utilities from a remote terminal or console, connect a modem to the file server cabinet using the RS232 connector labeled MODEM at the rear of the cabinet. The file server serial port is connected as a DTE device. Connect the modem to the phone lines according to the instructions in the modem's user manual (see below for modem switch settings).

Connect a modem at the remote site. The modem utility and the command MODEM ON/MODEM OFF (see the *PLAN File Server Installation and Operation Manual,* Chapters 3 and 4) are used to control whether or not the file server sends and receives console characters on the attached modem.

When the modem is in use, the characters displayed on the screen are also sent via the modem to a remote terminal. Keystrokes on the local terminal and the remote terminal are received (in turn) by the file server. First. however. the command MODEM ON must be issued at the console. MODEM OFF can be issued at the file server or at the remote site.

Transactions in this mode occur at a rate of 1200 baud, even to the local console (which is normally 9600 baud) because of modem transmission speeds.

2.5.1 The Modem Port

The wiring is as follows:

Modem Port

RS232 pin	Signal	To/From Server
3	Xmit data	To
2	Rcv data	From
5 (unused)	CTS	To
4 (unused)	RTS	From
20	DTR	From
7	Signal ground	Both
6	DSR	To

The modem port is wired as data terminal equipment. This is consistent with the wiring for most modems, that is, a 5-wire (or more) cable with corresponding pins connected should work correctly. The modem must send data on pin 3 and receive data on pin 2. It should assert pin 6 when the modem is ready and maintain the phone connection as long as it sees pin 20 asserted. The modem should be able to transmit and receive at 1200 baud.

2.5.2 Setting Modem Switches

For a Hayes Smartmodem 1200 connected to a remote termi-
nal, set the modem switches as follows:

1 Down
2 Up
3 Down
4 Up
5 Up
6 Down
7 Up
8 Down

For a Hayes Smartmodem 1200 connected to the local file
server:

1 Down
2 Up
3 Up
4 Down
5 Up
6 Down
7 Up
8 Up

For other modems, set the switches to

1200 baud
Full duplex
Autoanswer
DTR not supported by file server

Other modem switch settings are irrelevant to network use, and
should be set to meet local phone use requirements.

Chapter 3

PLAN 5000

Hardware Installation Information

3.0 Introduction

This section presents hardware installation reference material that is not included in the *PLAN 5000 Quick Installation Guide*. Since actual installation does not require knowledge of this information it is presented here for reference purposes.

3.1 Hardware Components

The PLAN 5000 File Server consists of the server hardware, the software that runs on it, and optionally a Print Server Feature Card.

See Figure 3-1 thru 3-2 for a front and rear view of the file server cabinet.

The PLAN 5000 can contain two 8" hard disks and the system will support up to four hard disks (two cabinets, two 8" disks per cabinet).

The file server cabinet contains two boards in a card cage: a CPU board and a Peripheral Interface Card (PIC)

A Print Server Feature Card may also be present or can be added later.

Another board, the disk/tape controller, is located on the right-side wall of the file server cabinet, toward the rear.

All internal hardware connections are completed before shipment; these connections are listed in Section 3.2.

Figure 3-1

PLAN 5000 File Server
Front View
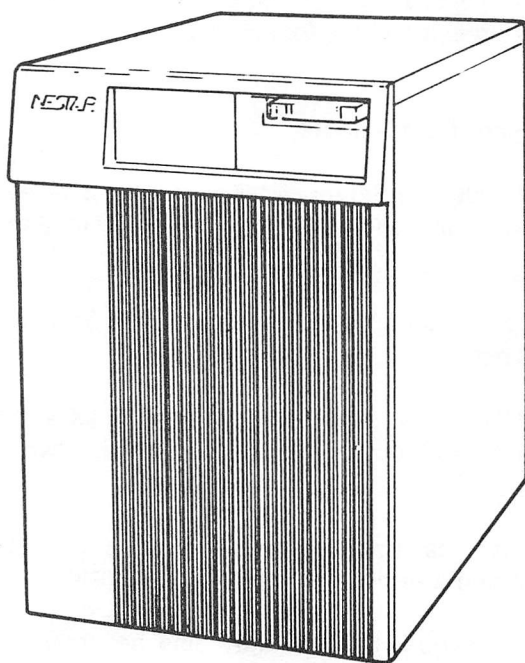
Figure 3-2

**PLAN 5000 File Server
Rear View**
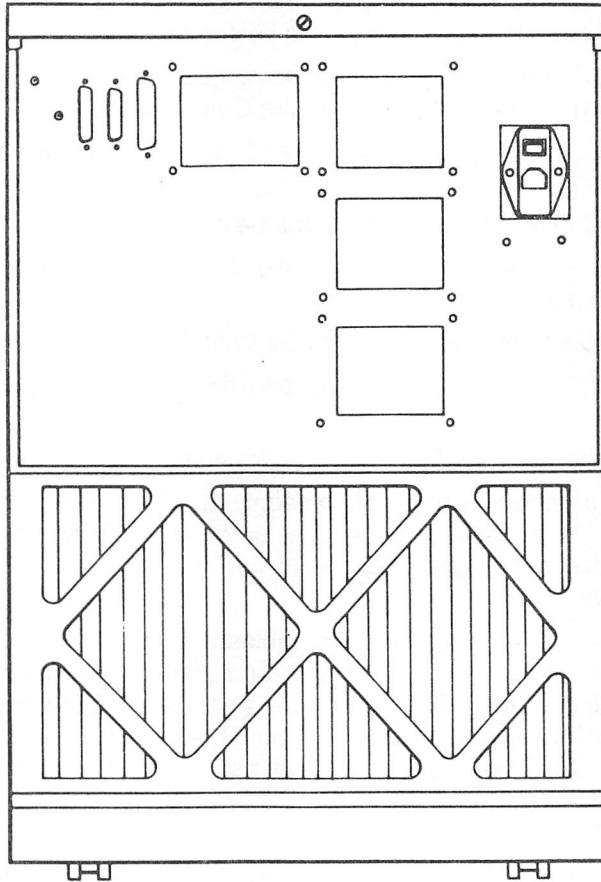
3.2 Internal Cabling

This section lists connections between cards (boards) and to the server back panel (see Figure 3-3).

3.2.1 Logic

a. CPU card – one 50-pin ribbon cable going to two RS232 ports on back panel (cable is split in rear).

b. PIC card – twisted pair cable to back panel BNC (network port) or to Print Server Feature Card, if present.

c. PIC card – connection to reset button on back of server box

d. PIC card – cable to the disk tape controller.

e. Cable from disk tape controller on top of bottom disk drive to tape drive.

f. Cable from disk/tape controller to first disk.

g. Cable from first disk to second disk in cabinet (50 pin ribbon).

h. Cable from second disk to back panel.

i. If a second cabinet is present, 50 pin D connector, flat, shielded cable from expansion-cabinet connector in first cabinet to 50 pin D connector on rear I O panel on second cabinet.

j. Print Server Feature Card cables per card. one 50 pin rib bon cable to two D connector parallel ports: one 26 pin cable to an RS232 port on the back panel; one twisted-pair 4 pin connector to the back panel reset button, twisted pair to back panel BNC; twisted pair from PIC to PSFC ('b above).

3.2.2 DC Connections

Main power supply

- primary 8" hard disk drive
- tape drive
- tape drive formatter
- disk/tape controller
- multibus card cage
- top DC fan
- main drive DC fan
- secondary hard disk (connected by separate harnesses to two power supplies)

AUX Drive Power Harness:

- to main power supply and second drive power supply (24V)

3.2.3 AC Connections

a. One cord from unit power socket to wall outlet.

b. Connections of main power supply to power input module (switch, filters, fuses).

c. If second drive is present, second drive power supply to main power supply AC.

Figure 3-3

Signal Cables

TAPE DRIVE

40p FLAT
15' MAX

50p FLAT
15' MAX

DISK CONNECTOR
50 PIN

PIC

DISK/TAPE
CONTROLLER

50p FLAT
2' MAX

68000
CPU
256 RAM

DISK

50p FLAT
15' MAX
DAISY
CHAIN

DISK

D-25 IDC CONNECTORS
(RS 232): CONSOLE
AND MONITOR

RESET
BUTTON

SERVER
NETWORK
CONNECTOR
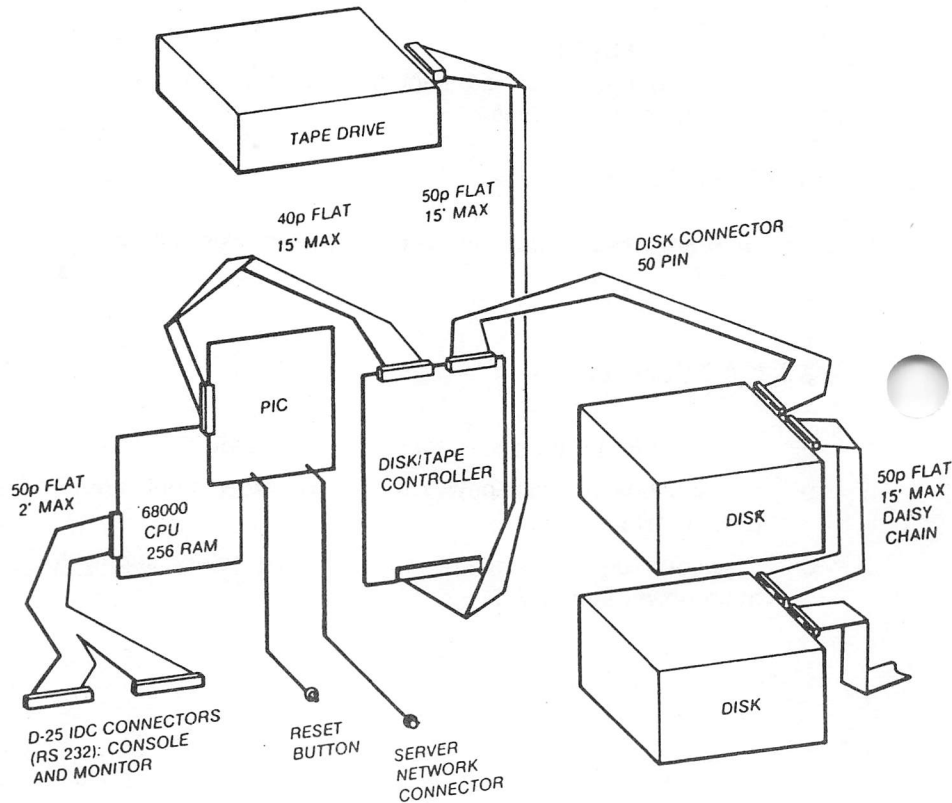
3.3 Connecting Terminals to the File Server Cabinet

See Section 2.4.

3.4 Connecting Local and Remote Modems for Use with the File Server

See Section 2.5

Chapter 4

Adding a Hard Disk

4.1 Adding a Hard Disk to the PLAN 4000 File Server

This section describes how to add an additional 14" disk to a PLAN 4000 file server.

The disk is shipped with the following parts:

- the disk
- a power cord
- signal cable (internal)
- signal cable (external)

There are two types of PLAN 4000 file servers: single and dual cabinet. The single cabinet file server contains an 8" disk drive and the dual cabinet file server contains a 14" disk drive.

4.1.1 Adding a Disk Drive to a Dual Cabinet PLAN 4000 File Server

1. Power down the file server and unplug the unit.

   (a) Notify users that the file server will be unavailable.

   (b) Remove the file server from the network by disconnecting the network coaxial cable from the network connector on the back of the file server.

   (c) Type "Quit" at the file server console to exit the file server software.

   (d) At the utility menu, select "Power down disk drives."

   (e) Turn off the file server.

   (f) Unplug the power cord for safety.

2. Remove the face plates on both storage cabinets by pulling forward on the top edge of the plate.

2
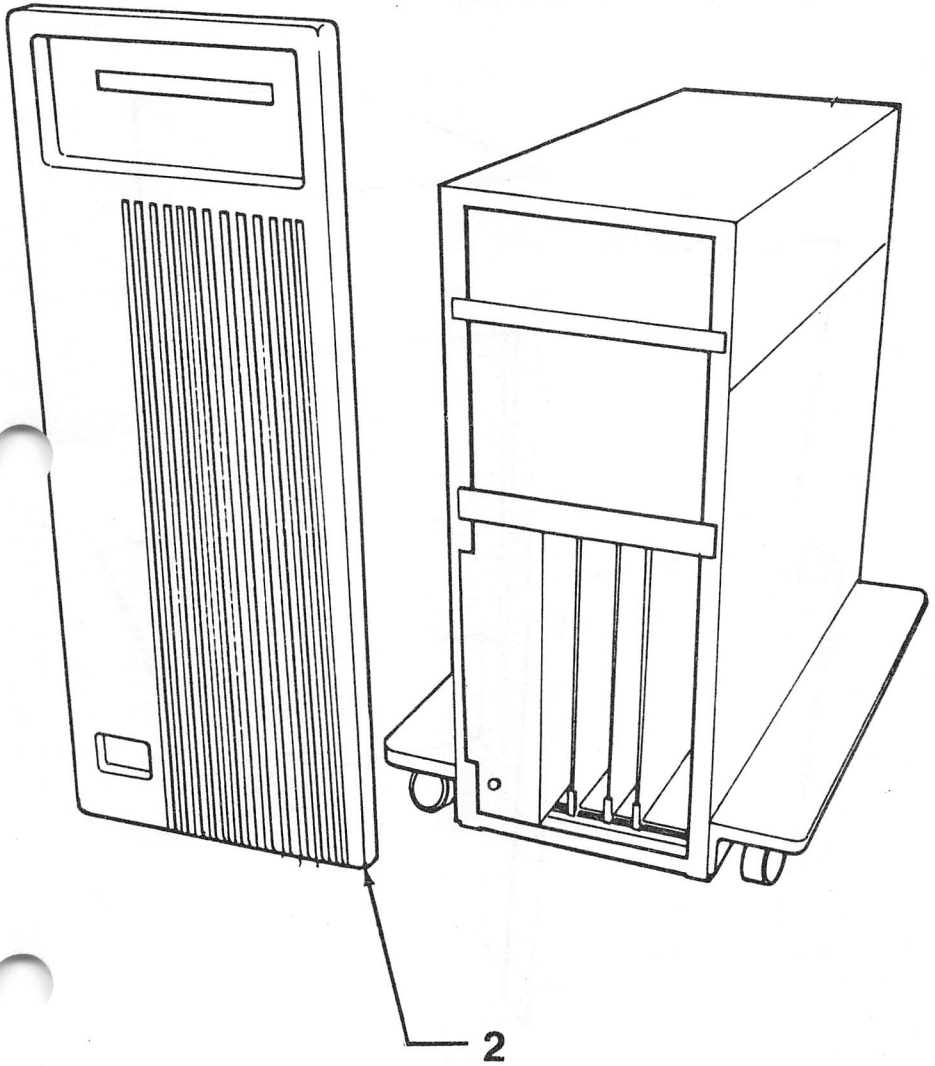
3. Remove the six (6) screws on the larger back panel of the first disk unit (or, if more than one disk exists, the last original disk unit installed).

4. Lock the disk if it is a one lock model (the lock is now accessible). Instructions on how to lock and unlock the hard disks can be found in Chapter 10.
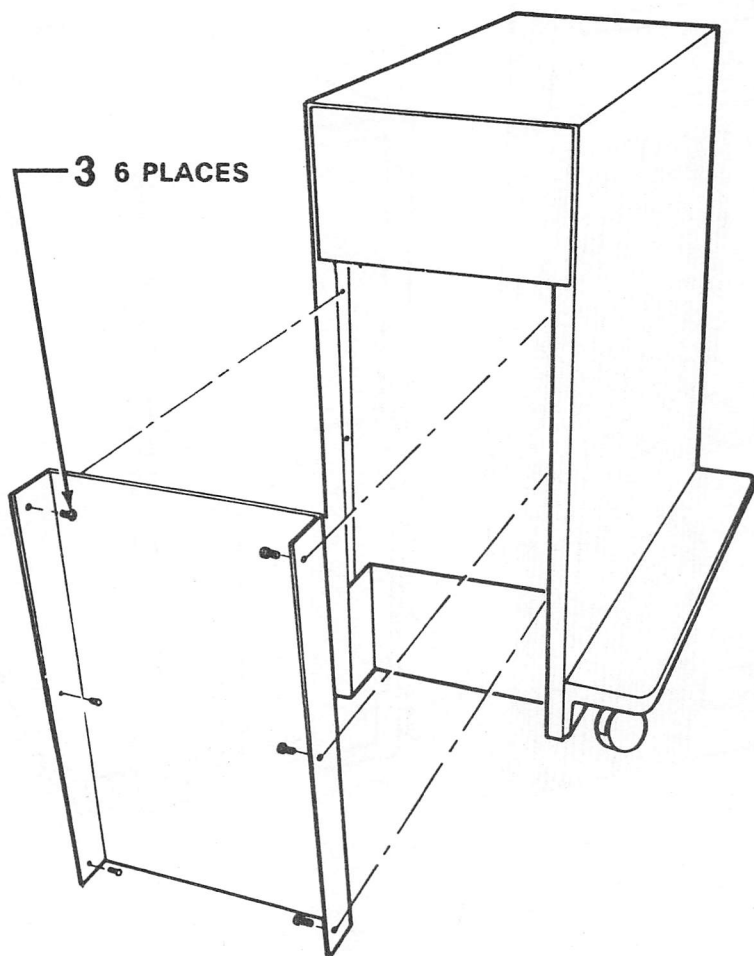
3 6 PLACES

5. Remove the rear lower plate on the last disk unit.

5 ────

4 PLACES
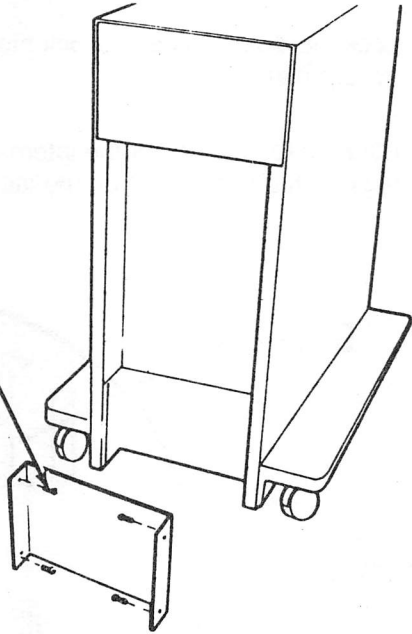
6. Remove the three (3) screws on the front of the disk units holding in the disk on the slides.

6

── **3 PLACES**
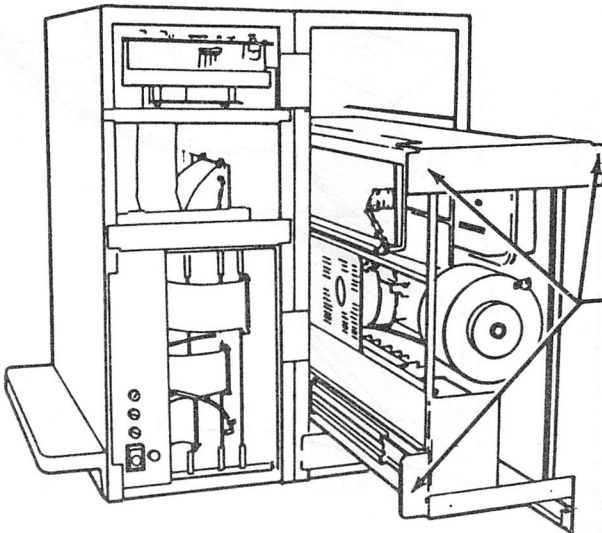
7. Gently slide the disk out to the stop.

8. Lock the disk if it is a two lock model (the lock is now accessible).

9. Plug the female end of the internal cable provided into J2 (next to the terminator) on the last disk unit.
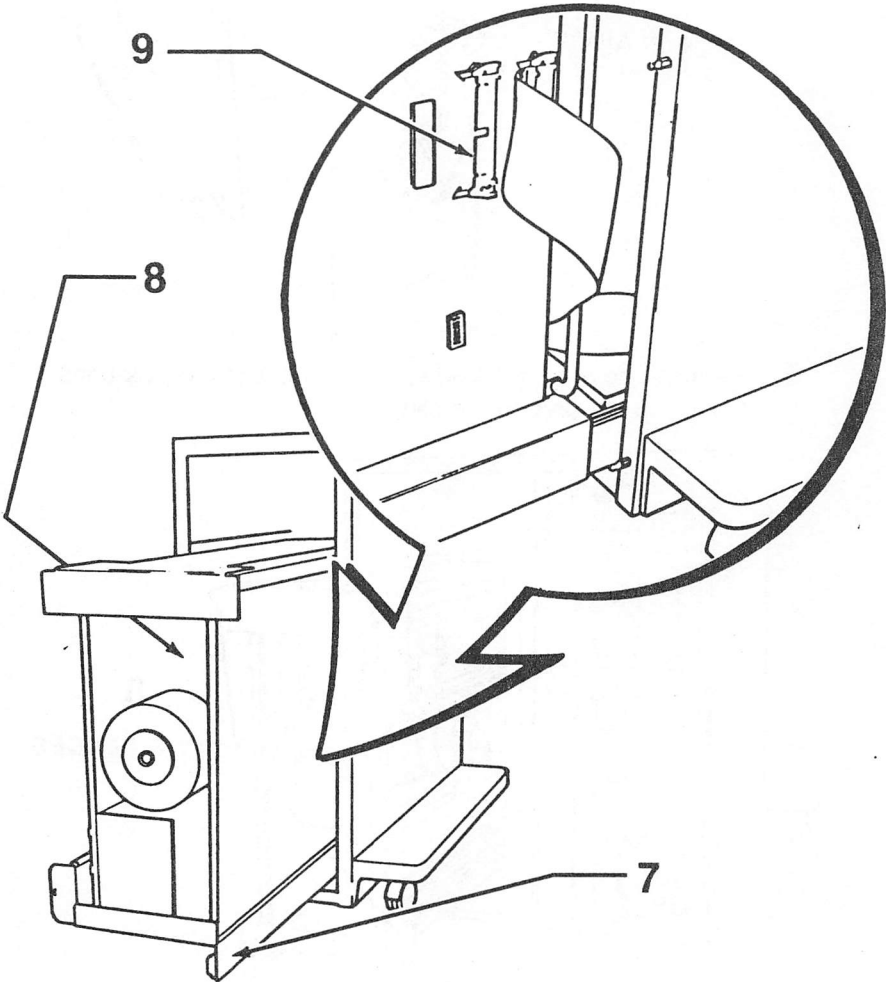
10. Mount the other end of the cable into the rear lower back panel of the storage cabinet of the last disk drive.

10 2 PLACES
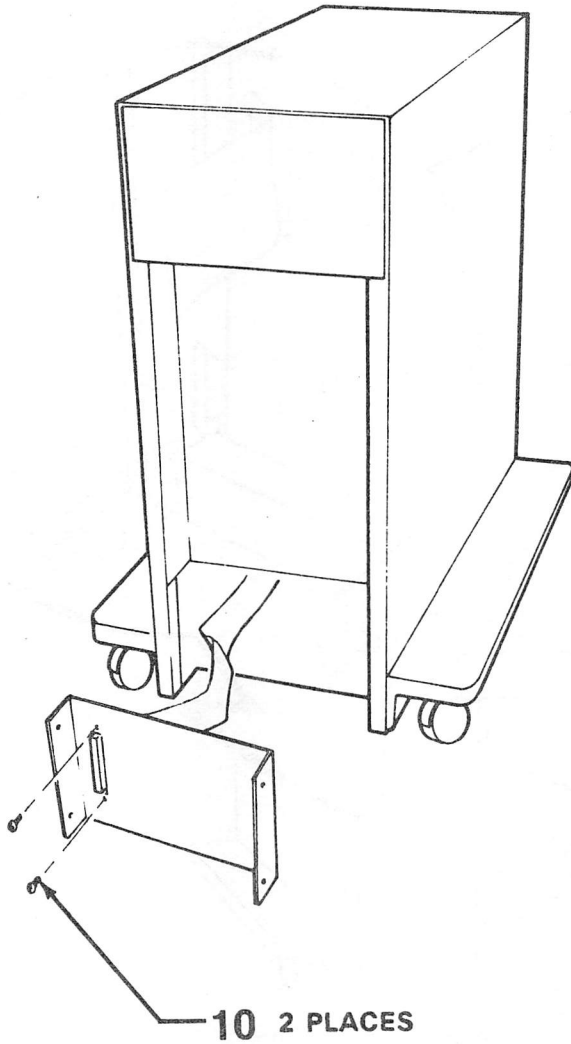
11. Check the disk switch setting on the newly installed disk. The last disk installed should be one number higher than the previous disk (tor example, if you are installing a second disk, the switch setting should be 2).

12. Remove the terminator resistor pack on the last disk. The newly installed disk should have a terminator installed.
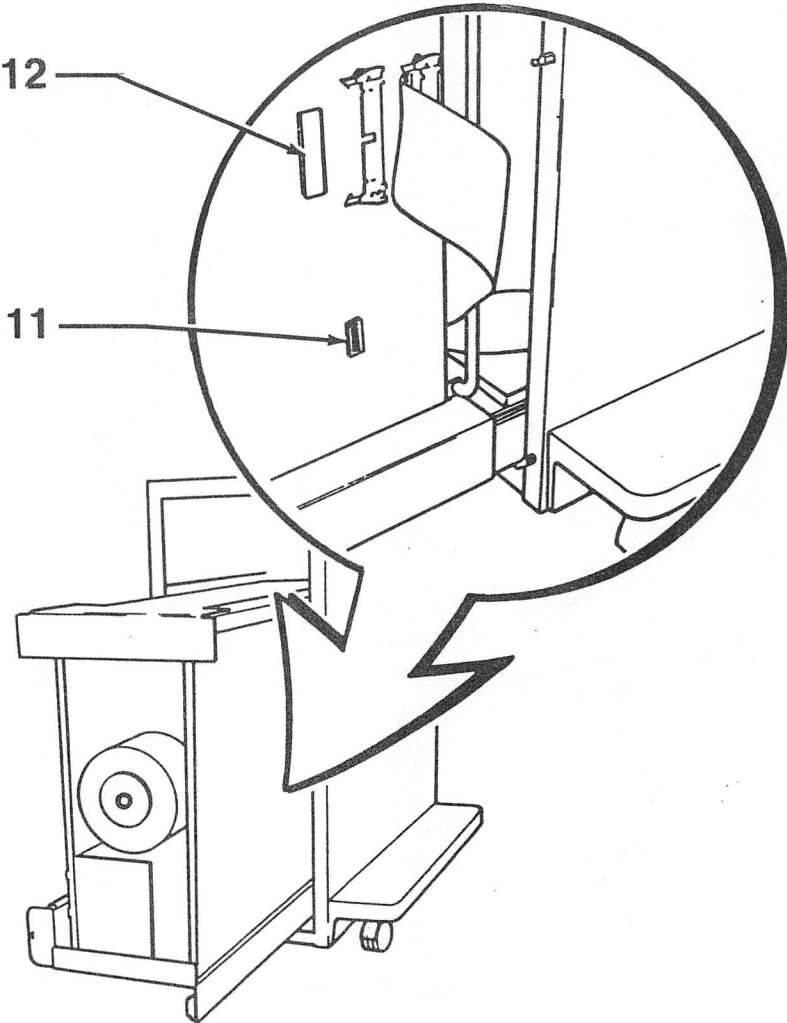
13. Install the external cable into the back panel of both storage units with the red stripe on the cable down.

SHIELDED CABLE
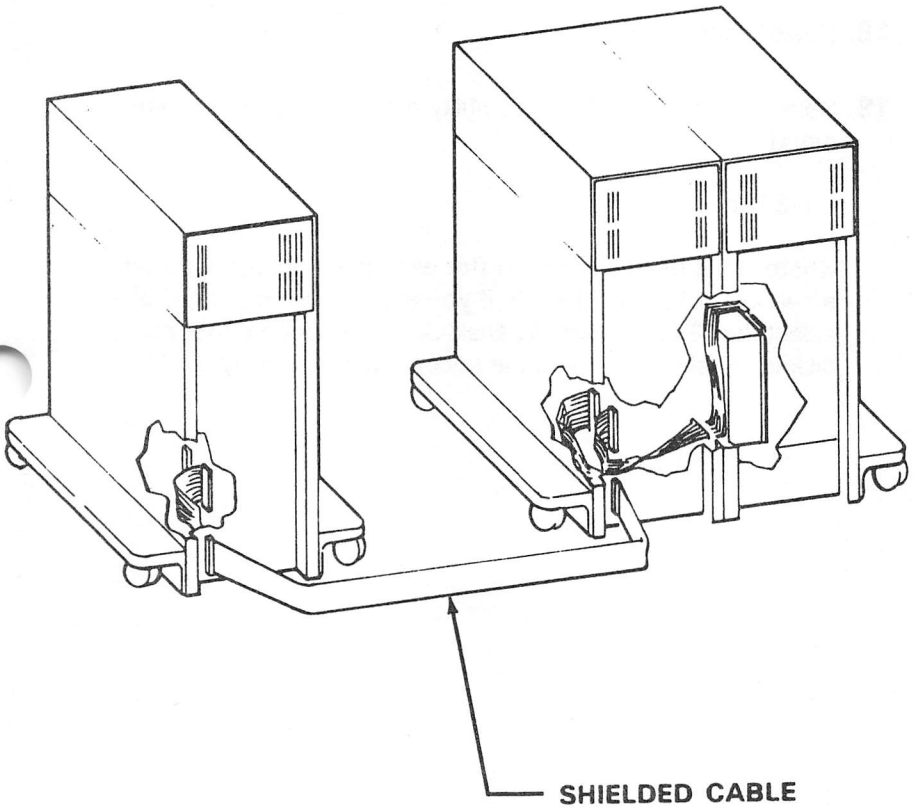
14. Unlock the disk locks on both disks. Move the units very carefully and slowly with the locks off and not powered on.

15. Slide the disk back in and replace the screws.

16. Install the back panel with the six (6) screws.

17. Replace the faceplates on the front of the cabinets.

18. Power up the system.

19. Select "File Server" from the utility menu and type the command

LIST /n

where "n" is the disk number (for example, if you just added a second disk, type LIST /2. If you want to rename the disk, select the "Examine/Modify Disk Contents" option (the first disk is usually /MAIN and the second disk is usually /ALT).

4.2 Adding a Hard Disk to the PLAN 5000 File Server

This section describes how to add an additional disk to a PLAN 5000 File server.

The disk is shipped with the following parts:

- the disk drive mounted on brackets
- an additional power supply
- four inches of alligator grommet
- four screws
- four nuts
- 50 pin ribbon cable
- tie wraps

4.2.1 Adding a Second Hard Disk to a PLAN 5000 File Server

1. Power down the file server:

    (a) Notify users that the file server will be unavailable.

    (b) Remove the file server from the network by discon-
        necting the network coaxial cable from the network
        connector on the back of the file server.

    (c) Type "Quit" at the file server console to exit the file
        server software.

    (d) At the utility menu, select "Power down disk drives."

    (e) Turn off the file server.

    (f) Unplug the power cord for safety.

2. Remove the top cover by loosening the captive screw on
   the top back edge.
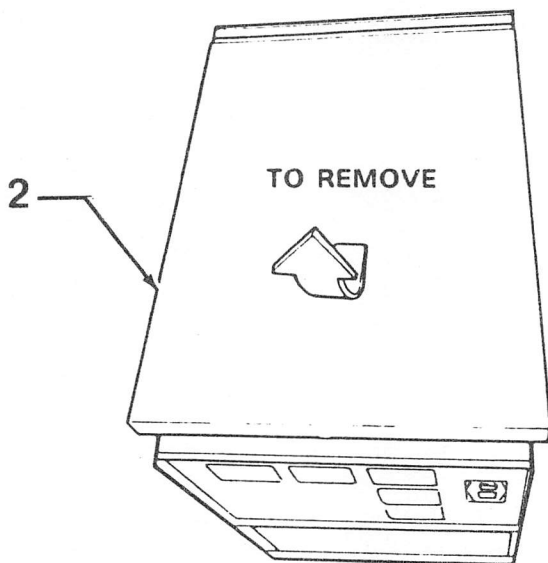
3. Remove the screen on the front (four screws).

3 **4 PLACES**
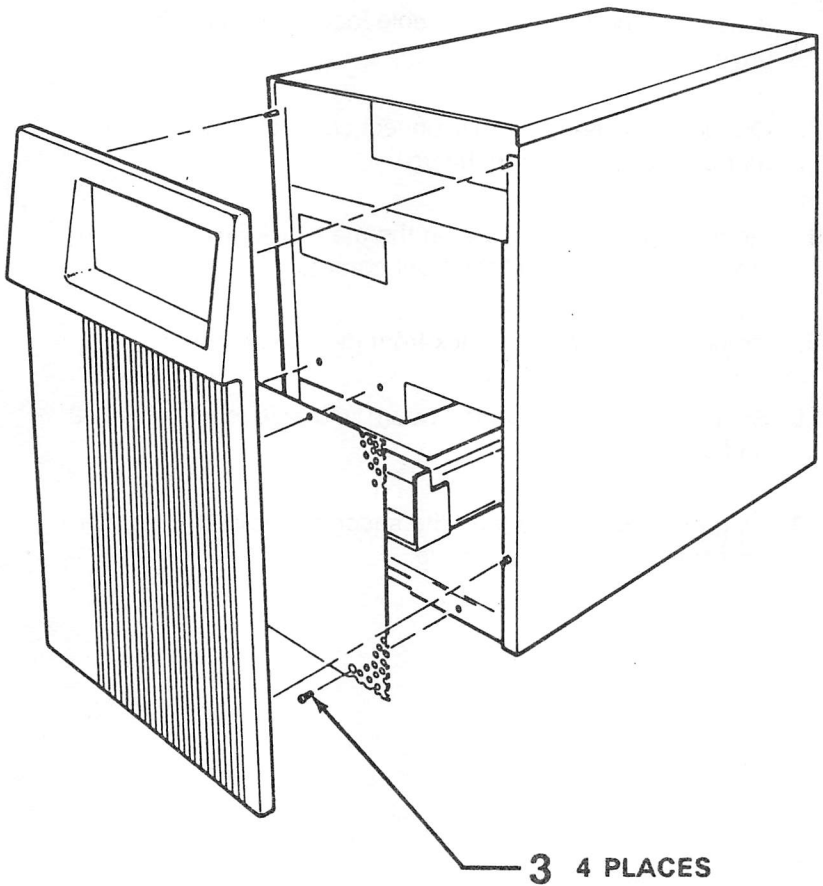
4. Slide the disk tray out and set it on the floor. **Caution:** make sure there is sufficient slack in the ribbon cable before pulling out the tray.

5. Check the disk switch setting on the newly installed disk; it should be set at 2.

6. Use the four nuts that come with the new disk drive to fasten it to the tray with the cable facing the main disk drive.

7. On the main disk drive. disconnect connector cable J2 and J4 from the drive control board.

8. Lift the drive control board on the main disk drive by pushing in the two snaps at the front corners.

9. Remove the terminator pack from the main drive.

10. Snap back the drive control board and reconnect cables J2 and J4.

11. Plug the ribbon cable from the second drive (J2) to connector cable J1 on the main drive.
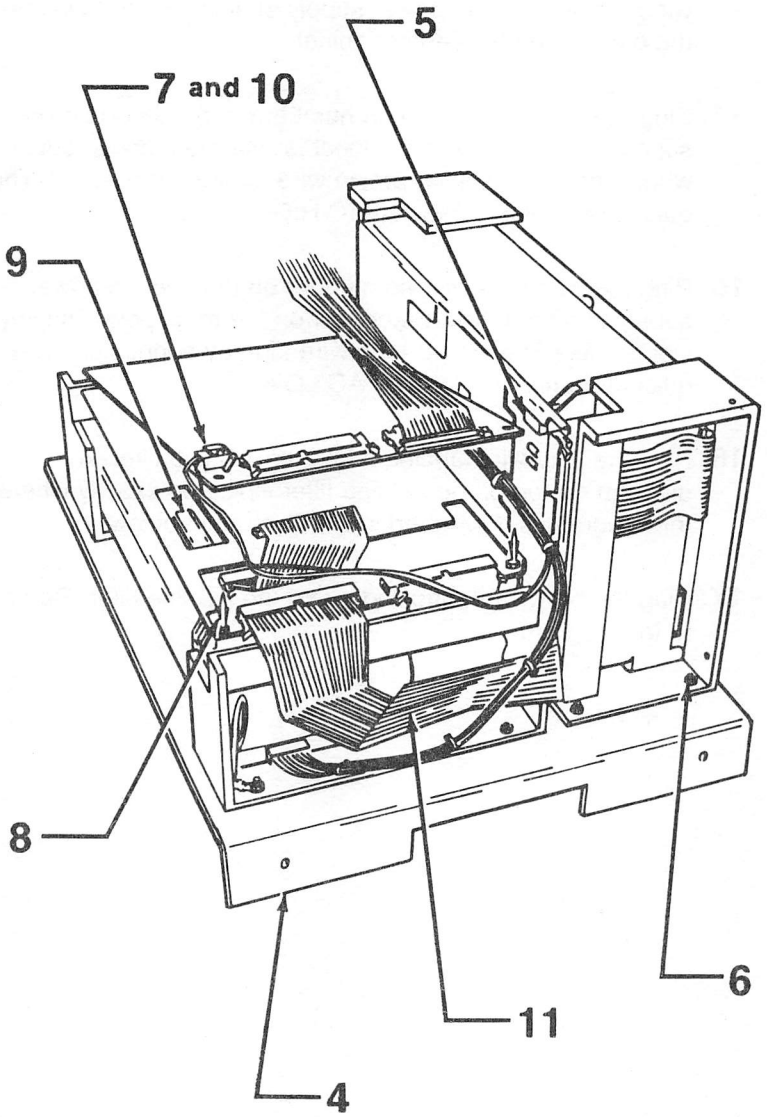
12. Remove the main power supply's protective cover (five screws, two on the bottom and three on top).

13. Position the second power supply on the chassis. The wires coming off the power supply should extend towards the back of the file server cabinet.

14. Plug the brown wire with no number on the second power supply into the quick disconnect on the main power supply where there is a similar brown wire already connected. The quick disconnect is labeled AC HIGH.

15. Plug the blue wire with no number on the second power supply into the quick disconnect on the main power supply where there is a similar blue wire already connected. The quick disconnect is labeled AC LOW.

16. Plug the blue wire labeled 3 into the AC line filter. A diagram on top of the AC line filter indicates exactly where; this diagram is duplicated in the illustration below.

17. Plug the brown wire labeled 4 into the AC line filter. Refer to the diagram.

12 5 PLACES
(2 UNDERNEATH)

14

15

16

17

13

Series

1
3

4

2

Parallel

AC HI LO GND
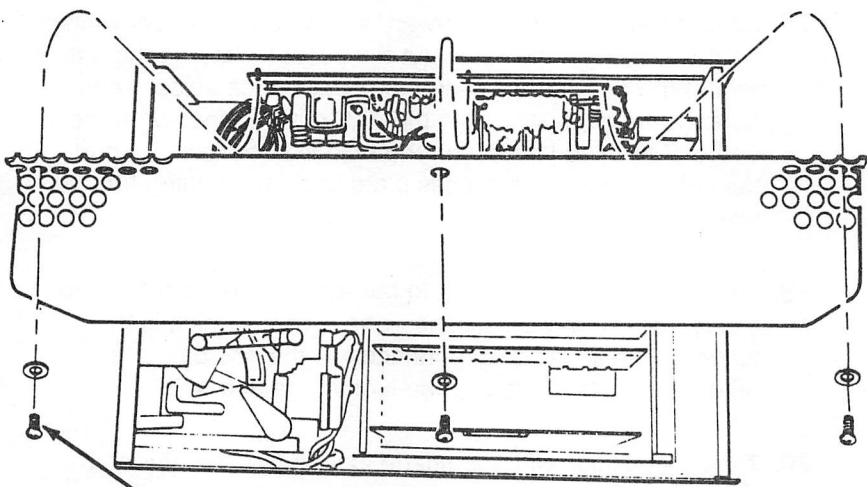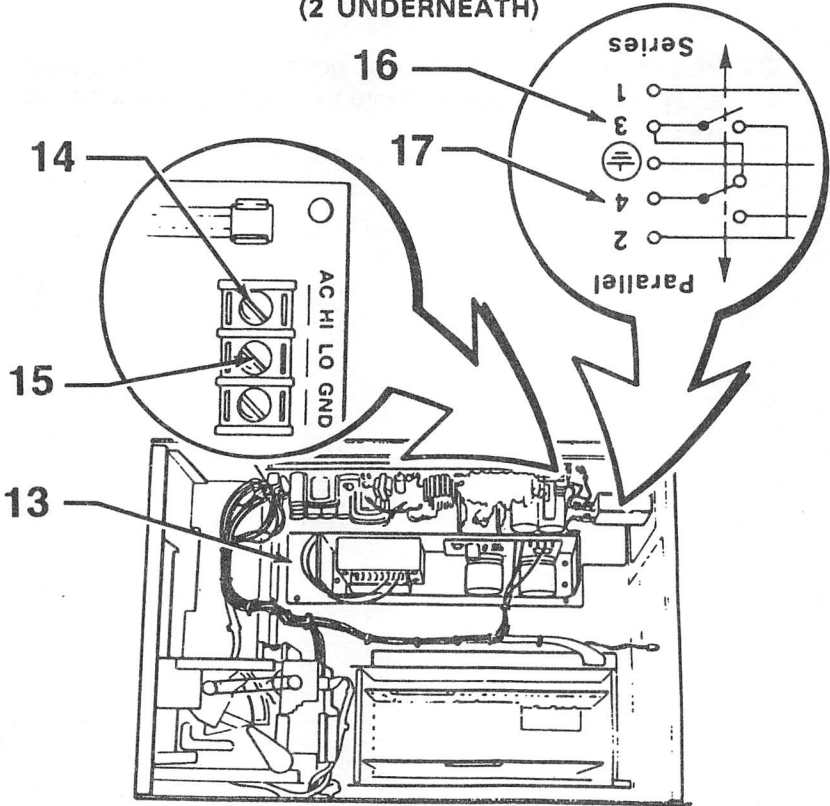
18. Lead the wiring harness forward following the current wiring harness. Loosen the screw on the access plate on the bottom of the cabinet and slide the access plate aside. Then take the wiring section with the disk drive connector at the end of it and feed it through the hole into the lower part of the cabinet. Slide the access plate back and tighten the screw.

19. Lead the wiring harness up to the main power supply. The wiring splits into two sections: one section, which is the longest, has a disk drive connector at the end of it; the other section has three spade lugs at the end of it.

20. Take the section with the spade lugs at the end of it and plug the red wire with no number into the bottom quick disconnect on the first power supply near the other red wires.

21. Plug the wire labeled 5 into the position 5 quick disconnect and plug the wire labeled 6 into the position 6 quick disconnect.
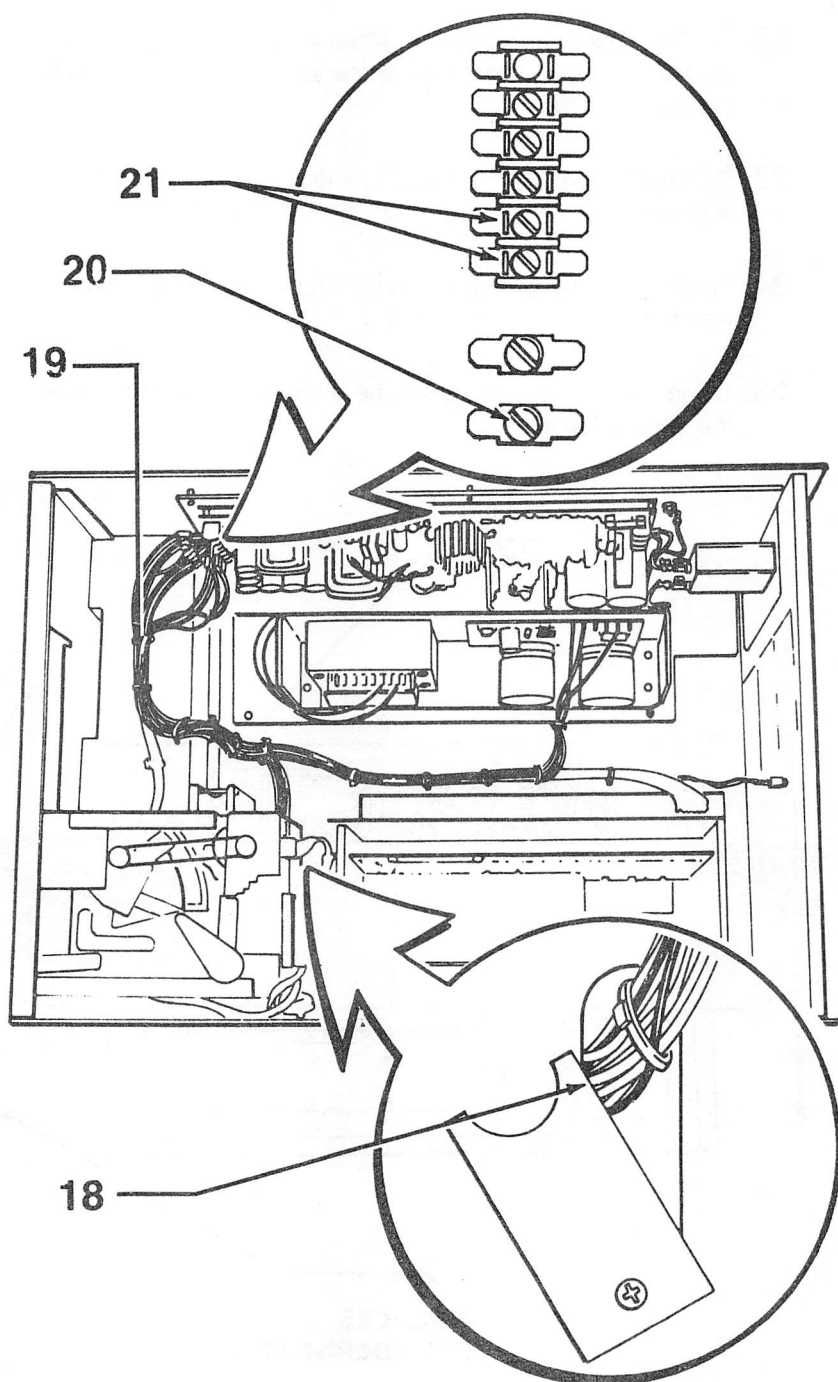
22. Put the alligator grommet on the main power supply's protective screen to protect the wires you've just connected to the AC line filter.

23. Replace the main power supply's protective screen (five screws).

24. Fasten the new, secondary power supply to the chassis with the four screws provided.

25. Using the tie wraps supplied, tie the new power harness to the current harness.

**5 PLACES
(2 UNDERNEATH)**

24
4 PLACES

25
NUMEROUS
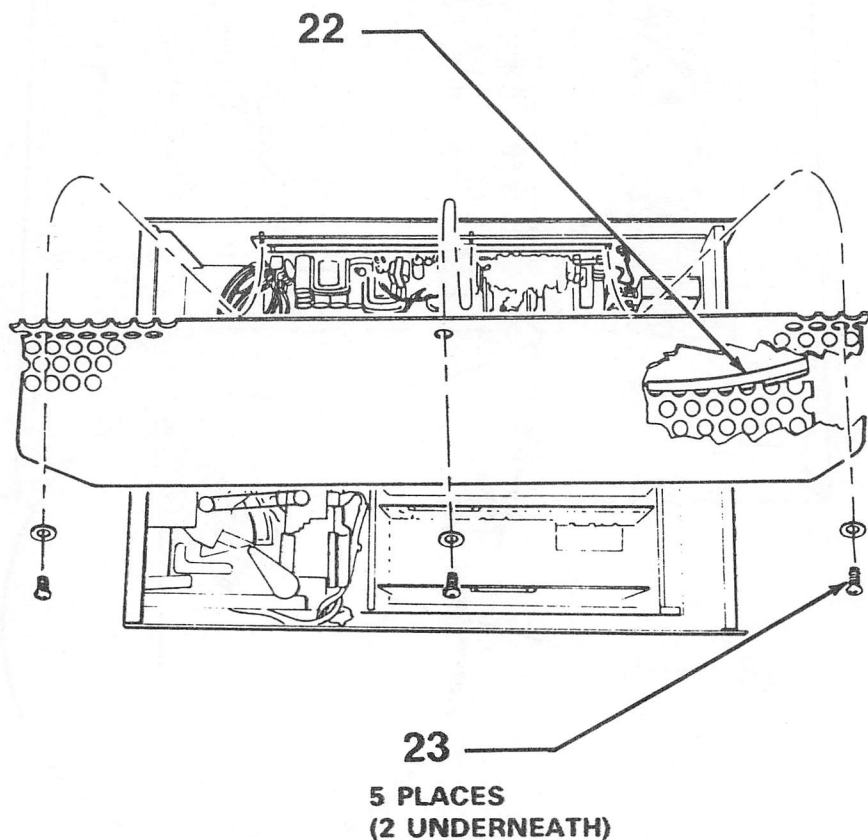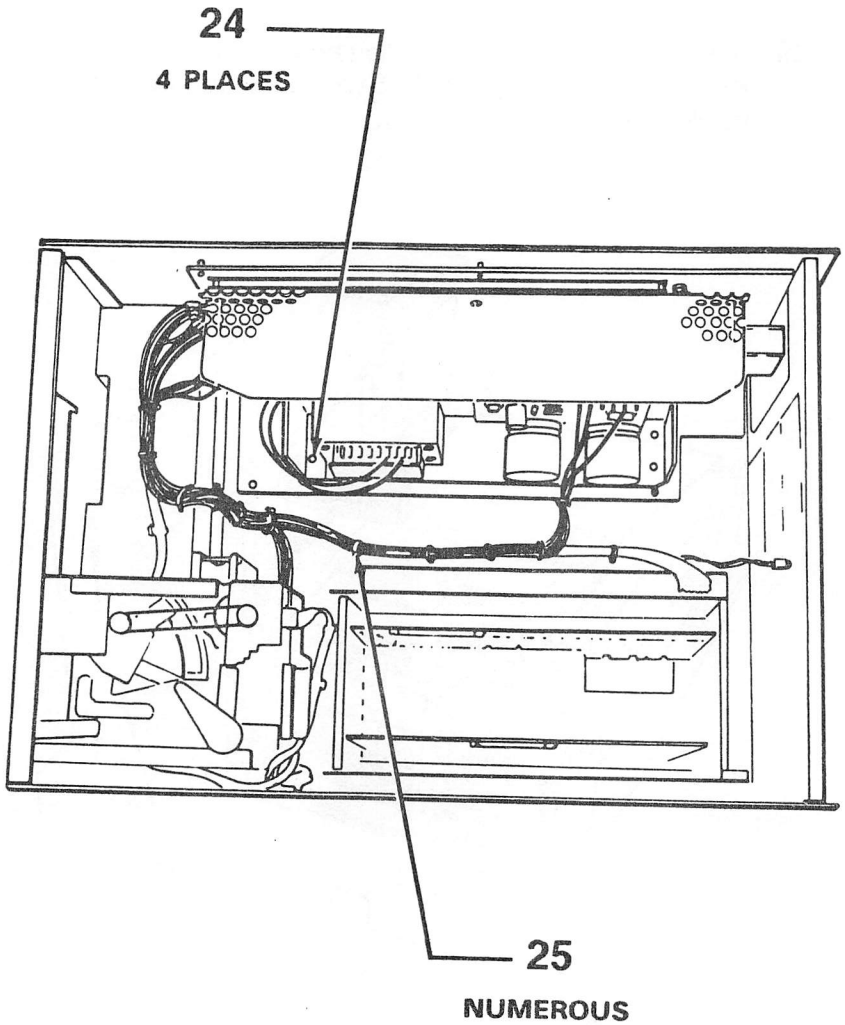
26. Plug the connector from the second disk drive into the power connector on the second disk drive.

27. Slide the disk drives into the cabinet (being careful of the ribbon cable) and screw the screen back in place.

28. Snap the front panel in place. Re-check the wiring connections of the new power supply. Replace the top cover on the file server.
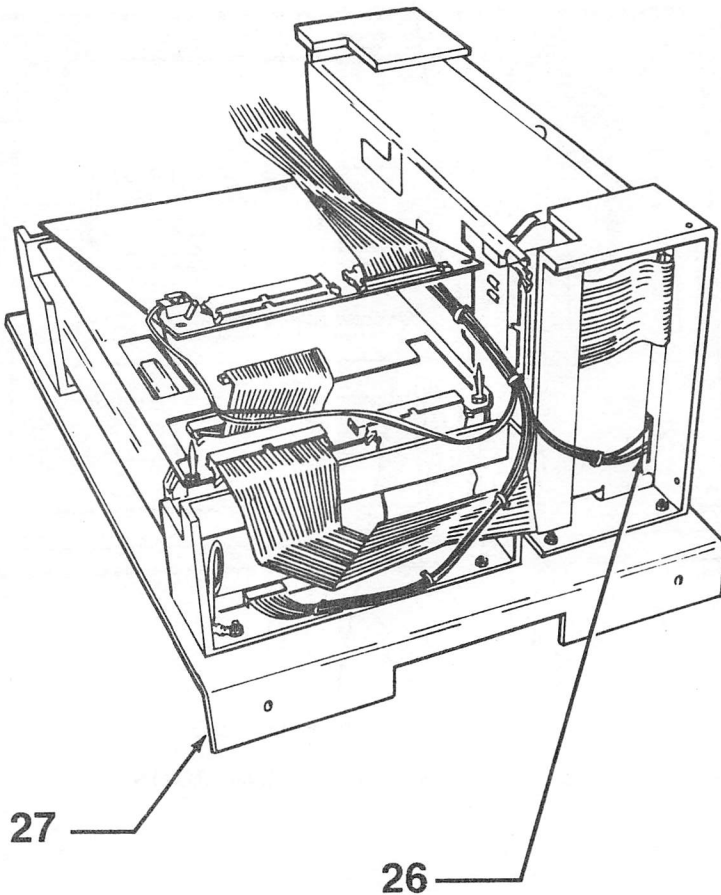
Chapter 5

External Cabling

5.0 Introduction

This chapter describes coaxial cable preparation and installation.

If your network uses fiber optic cable, you will need the Raycom 0800 Field Termination Kit. Refer to the Product Manual that comes with the kit for installation instructions

5.1 Coaxial Cable Preparation and Installation

If coaxial cable segments are fabricated at your site, male BNC connectors must be attached to each end Considerable care must be exercised to ensure that the connection is mechanically and electrically sound.

You will need the following equipment (or the equivalent):

	Part Number
Belden RG62 Indoor Teflon Cable	89269
Belden RG62 Indoor Cable	9269
Commercial Hand Tool	220190-1
AMP cable cutting tool	11186
AMP BNC crimping die	220189-2
AMP BNC male connectors	227079-3

Follow these steps to prepare and install the cable. This procedure varies according to the type of cable and brand of BNC connectors used; the description given applies to RG-62A/U cable and the BNC kit distributed with the system.

(1) Ensure that the end of the cable is clean, and not ragged, dirty or damaged.

(2) Slip a ferrule (metal sleeve) up the cable.

(3) Cut through the top (black) layer of the cable 1/2" from the end. Take care not to cut through the copper braid beneath the black layer. Strip off 1/2" of black layer.

(4) Separate the exposed copper braid and cut off 7/32" of the braid, exposing 7/32" of the white plastic inner sheath underneath it.

(5) Cut off this 7/32" of the white plastic sheath. Take care not to cut the inner wire that it contains. 7/32" of the wire will now be exposed.

(6) Slip a BNC pin onto the exposed inner wire and use a crimping tool to fasten the pin to the wire.

(7) Slip a BNC male connector over the pin. The BNC sleeve should fit over the white plastic sheath under the fringe of the upper braid.

(8) To secure the connector, slip the ferrule down until flush with the connector, creating a sandwich of metal sleeve (outer), coax (middle), and connector (inner). Use a crimping tool to compress the metal sleeve and lock the assembly.

Figure 5-1

Coaxial Cable Connectors
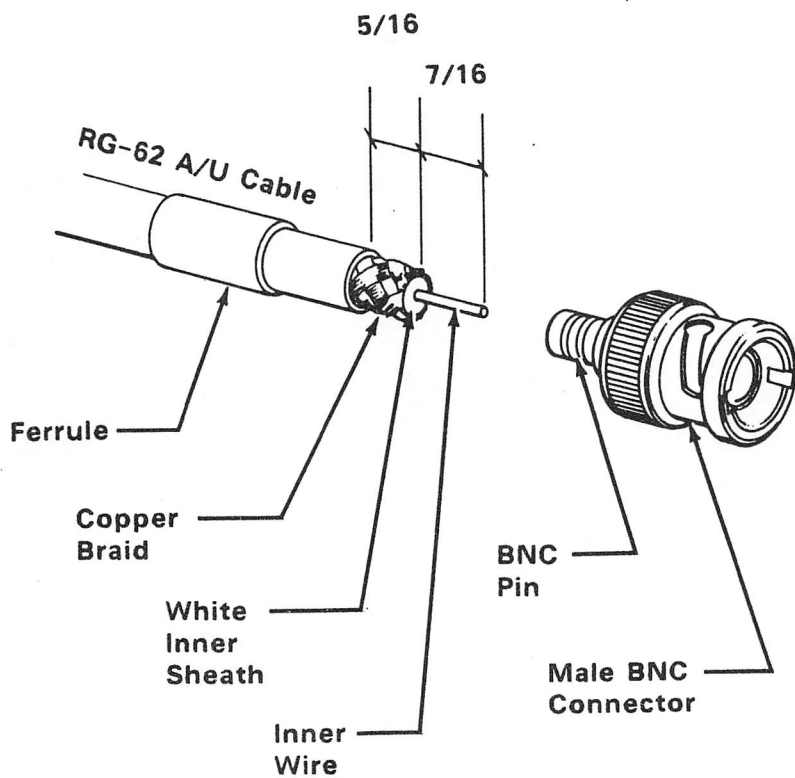
Coaxial Cable Diameter + 0.242 + 0.003 in.

Chapter 6

Setting the Interrupt Level

on the IBM PC

6.0 Introduction

The software for the PLAN Series IBM PC NIC uses interrupts as part of its normal operation. The IBM PC has six available interrupt levels designated 2 through 7. The standard NIC is configured to use interrupt level 2, but no two peripheral cards can use the same interrupt level. This chapter explains how to change the NIC interrupt level when necessary to avoid a conflict with other peripherals.

Since the interrupt lines on the IBM PC are active-high driven outputs, an interrupt level can not be shared with other peripheral cards even if one of the cards has been software configured to cause no interrupts.

6.1 Interrupt Level

The interrupt level is indicated by the presence of certain short vertical connections in the NIC near the bottom of the card labeled W2 and W2. The following table shows the required settings of the W1 and W2 connections for various interrupt levels, where " | " is a wired connection and " - " is no connection.

Interrupt Level	W1			W2					
2	|	-	|	|	-	-	-	-	-
3	-	-	|	-	|	-	-	-	-
4	|	|	-	-	-	|	-	-	-
5	-	|	-	-	-	-	|	-	-
6	|	-	-	-	-	-	-	|	-
7	-	-	-	-	-	-	-	-	|
	0	1	2	2	3	4	5	6	7

6.2 Procedure

Perform the following tasks to modify the interrupt level.

(1) Power off the computer and remove the NIC.

(2) On the **back side** of the W1 and W2 areas, break the short vertical PC board traces that set the interrupt level to 2. There are three such traces in positions W1-0, W1-2, and W2-2.

(3) Solder short vertical wire jumpers into the positions as indicated by the table.

(4) **Important Note:** NICs that are marked Rev A, B, or C in the upper left corner have an error which MUST BE FIXED if (and only if) the interrupt level is set to 4, 5, 6, or 7. Pin 6 of IC20, a 74LS244N near the bottom middle of the card, is mistakenly grounded. It must be lifted from the board or socket and connected with a short wire to a source of +5 such as pin 20 of the same IC. (Pin 1 is in the lower left corner of the IC, and is soldered into a square pad. Pin 20

is directly opposite pin 1.) NICs at Rev D or later have the error fixed and only the connections at W1 and W2 need be changed.

6.3 Example

The default interrupt level is 2. If you wish to change to interrupt level 4, change the connections as follows:

```
        W1                              W2

    |   |                           |
    |   |                           |

    0   1   2               2   3   4   5   6   7
```
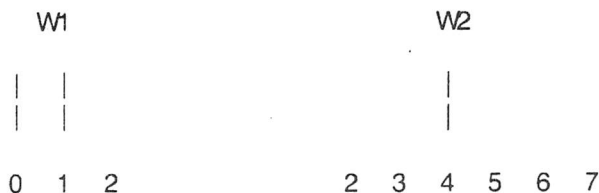
In addition, if this is a Rev C or earlier NIC, pin 6 of IC20 must be lifted and wired to +5.

6.4 Other Notes

(1) **IBM BISYNC:** Some revisions of the IBM Binary Synchro- nous Communication Adapter (Part number 1502075) have an error that causes the level 2 interrupt line to be con- nected to +5. The errant trace connects peripheral line B3 to B4 and must be cut if the NIC uses interrupt level 2. Cut the trace from the B4 connector finger to the feedthrough that comes from the B3 finger. IBM has fixed the problem in later revisions of the board.

(2) **HYPERION:** The Hyperion Personal Computer uses inter- rupt level 2 internally, so the NIC interrupt level must be changed. In addition, interrupt level 7 is not wired to the expansion chassis. Interrupt levels 3 or 4 are recommended for the Hyperion.

(3) **Other IBMPC Lookalikes**: The Eagle PC, Columbia, Corona, and Compaq personal computers that are like the IBM PC have been tested and have no interrupt conflict on level 2 from internal circuitry.

Chapter 7

Error Codes

7.0 Introduction

This chapter describes error codes.

File server error and information messages are listed in Appendix A of the *PLAN Series File Server Installation and Operation Manual.*

7.1 Hard Disk and Tape Errors

Disk and tape error codes are reported in hexadecimal by the file server (the file server program and the various offline utilities). They consist of two parts:

a. A disk or tape error code, described in the table in Section 7.1.1.

b. A device subcode which is device dependent and describes the details of the error.

You should contact your service representative immediately upon discovery of a hard disk error. Record both the error code and the subcode for your service representative.

7.1.1 Hard Disk and Tape Error Codes

CODE

(HEX)	DESCRIPTION
00	GOOD EXECUTION
01	GOOD EXECUTION; SEEK RETRY AFTER SEEK FAULT ERROR
02	GOOD EXECUTION; SEEK RETRY AFTER CYL MISMATCH ERROR
04	GOOD EXECUTION; DATA RETRY AFTER ID CHECKSUM ERROR
05	GOOD EXECUTION; DATA RETRY AFTER CRC ERROR
08	TAPE READ OPERATION COMPLETE; TERMINATED BY FILE MARK
13	DRIVE SEEKING
18	REWIND; POSITION COMMAND IN PROGRESS
19	ERASE TAPE; POSITION COMMAND IN PROGRESS
1A	RETENSION; POSITION COMMAND IN PROGRESS
1B	ADVANCE FILE MARK; POSITION COMMAND IN PROGRESS
1C	TRANSPARENT BACKUP IN PROGRESS
1D	TRANSPARENT RESTORE IN PROGRESS
20	DISK DRIVE NOT PRESENT
21	SEEK FAULT
23	SECTOR NOT FOUND
24	ID CHECKSUM ERROR
28	DISK WRITE PROTECTED
30	INVALID CONTROLLER COMMAND
31	INVALID DISK DRIVE
32	INVALID HEAD
33	INVALID CYLINDER
34	INVALID SECTOR
36	INVALID DRIVE ID
37	INVALID SECTOR SIZE (OTHER THAN 128,256 OR 512)
38	DISK OVERRUN (MAX CYLINDER)
40	BAD SECTOR DETECTED BY CRC VERIFY ROUTINE
41	DEFECT EXISTS
42	DEFECT MAP FULL

43	NO DEFECT MAP
44	NO SPACE FOR ALTERNATE
45	DEFECT NOT FOUND
60	TAPE DRIVE NOT PRESENT
61	TAPE CARTRIDGE WRITE PROTECTED
62	FILE MARK DETECTED
63	BLOCK IN ERROR NOT FOUND
65	HARD DATA ERROR
68	CARTRIDGE NOT IN PLACE
69	END OF TAPE
6A	TAPE NOT ONLINE
6B	TAPE RESET OCCURRED
6C	BEGINNING OF TAPE
6D	NO DATA DETECTED
6E	ILLEGAL COMMAND (TO TAPE DRIVE FROM CONTROLLER)
70	INVALID COMMAND WITH TAPE WRITE MODE SET
71	INVALID COMMAND WITH TAPE READ MODE SET
73	TAPE NOT AVAILABLE (CURRENTLY BEING USED IN XPARENTCOM)
80	CONTROLLER RESET HAS OCCURRED
F0	NO COMMAND; AWAITING ACKNOWLEDGEMENT
F4	TRANSPARENT COMMAND NOT COMPLETE
F8	NO TRANSPARENT COMMAND IN PROGRESS

7.1.2 Device Error Subcodes

When a device dependent error occurs, a subcode is displayed; interpretation of it depends on the device type. The subcode is displayed in hexadecimal.

Each subcode is a single byte; the bits represent various conditions. Several bits may be on simultaneously so that their sum represents the total subcode. Not all bits indicate errors; some are simply status information. A device error subcode of 0 indicates no subcode is given for the device causing the error.

A conversion table for decimal, hexadecimal, and binary numbers appears in Appendix A.

7.1.2.1 Hard Disk Device Subcodes

PLAN 4000 and 5000 File Server

$01 Ready

The drive is up to speed. servo system is locked onto a servo track, and the unit is in a state to read. write or seek.

$02 Seek Complete

The bit is set when seek operation is completed.

$04 Seek Fault

This bit indicates that a fault was detected during a seek operation.

$08 Cylinder Zero

The access arm is positioned over cylinder 0.

$10 Busy

The drive is in the process of executing a command.

$20 Drive Fault

A fault was detected by the drive error monitoring circuitry.

$40 Write Protect

The drive selected is write protected. Write protection is set by switches in the drive or when the drive is not sequenced up.

$80 Command Reject

A control or Register Load Command was received while the drive was not ready, or an undefined command was received.

PLAN 3000 File Server

$01 Reserved for disk/tape controller.

$02 Reserved for disk/tape controller.

$04 Reserved for disk/tape controller.

$08 Reserved for disk/tape controller.

$10 Drive Fault

A fault was detected by the drive error monitoring circuitry.

$20 Seek Complete

The bit is set when seek operation is completed.

$40 Cylinder Zero

The access arm is positioned over cylinder 0.

$80 Ready

The drive is up to speed, servo system is locked onto a servo track, and the unit is in a state to read, write or seek.

7.2 Errors While Booting the File Server

This section describes errors that may occur when booting the file server.

7.2.1 Errors while Booting from Hard Disk

If a hardware error occurs during boot, attempt to diagnose the problem and report it. All errors that occur while booting from the hard disk are serious and should be reported to your service representative immediately.

The following table is a list of the messages and their meanings.

Disk drive not attached to PIC

Indicates the Peripheral Interface Card is not communicating with the controller. Possible causes are a damaged PIC, cable, or disk controller or the PIC is not fully seated in the card cage. Press firmly to reseat.

Drive error when identifying drive. Code is $xx.

A hard disk error occurred while accessing the boot drive. See Section 7.1.1 for list of the error codes and their meanings.

$36 indicates that the drive is unformatted.

Drive error while reading boot volume. Code is $xx.

A hard disk error (error code xx) occurred while reading the boot volume //SYSTEM/FILESERVER. See Section 7.1.1 for a list of the error codes and their meanings.

PIC missing or not working

Indicates the file server could not access the PIC (usually in slot 3 of the card cage). The PIC is not present in the machine or is not working.

Disk sector 0 is not initialized

The disk does not have a directory structure placed upon it. Indicates corruption of the disk structure.

Disk boot volume pointer not set

Indicates there is no boot volume set for this drive.

7.2.2 Errors while Booting from Server Diagnostic Tape

If a hardware error occurs during the boot process, attempt to diagnose the problem and report it. The following is a list of the messages and their meanings.

Tape is not a server diagnostic tape

Indicates a tape of the wrong type was inserted in the drive. Only diagnostic boot tapes, not backup tapes, can be used to boot the server.

Version of the diagnostic tape must be version 2.0 or later

Indicates an attempt was made to boot from a tape older than the boot ROM.

Checksum error on diagnostic tape

Indicates an error while reading the tape. Possible causes are a damaged tape or a defective drive or controller.

Error during tape read. Result is $xx.

Indicates an error occurred while reading the boot tape. See Section 7.1.1 for a list of the error codes.

7.3 System Errors

If the file server detects a run-time error the following message is displayed:

```
***** SYSTEM ERROR *****
error type _____
System stack is: iiii jjjjjjjj kkkk mmmm nnnnnnnn
Hit return to reboot server...
```

Error type is a message describing the error.

If this occurs, contact your network service representative immediately. You should record the full contents of the file server's console (for your service representative's use). Then reboot the file server and check the consistency of the disk (see the *File Server Installation and Operation Manual*, Section 4.9) before allowing the file server software to execute.

Chapter 8

Unlocking Hard Disks on the File Server

8.0 Introduction

This chapter describes how to unlock the hard disks on a PLAN 4000 File Server (the PLAN 3000 and the PLAN 5000 hard disks have no disk locks).

All hard disks on a PLAN 4000 must be unlocked before the file server is powered on.

Do not unlock the hard disks until the file server and storage cabinets have been placed in their permanent positions. The cabinets should not be moved once the hard disks are unlocked and the locks on the front caster wheels on the cabinets should be set in the up (locked) position.

8.1 Procedure

Remove the front panel of the cabinet labeled FILE SERVER if an 8" disk is present in the cabinet. Remove the front panel of any file server cabinets labeled STORAGE. Slide the 14" or 8" hard disk out of each storage cabinet.

Unlock the 8" and 14" disks as shown in Figures 10-1 thru 10-3. The 14" disks may have no lock, one lock (head/spindle), or two locks (head and spindle). The 8" disk may have no lock or one lock (head/spindle).

The 8" spindle lock is located in the front of the disk unit. To reach it, remove the file server cabinet's front panel. Before unlocking the spindle lock (as shown in the figure), remove the small square of cardboard wedged under it.

When there is a 14" disk lock and two locks are present, the locks are located on the side of the disk. To access them, remove the front panel, remove the three screws that hold the

disk in the closed position, then pull the disk out of the storage cabinet in its drawer. You must unlock both head and spindle locks on the 14" disk.

When only one 14" lock is present, it is located at the rear of the disk. You can reach it through the access door in the rear of the file server cabinet. Unlock it by moving it to the up position.

Confirm that the 14" hard disk is in fact unlocked by turning the spindle manually.

Figure 8-1

Unlocking 14" Hard Disks
(2-lock model)

SPINDEL LOCK   HEAD LOCK

(SHOWN IN UNLOCKED POSITION)
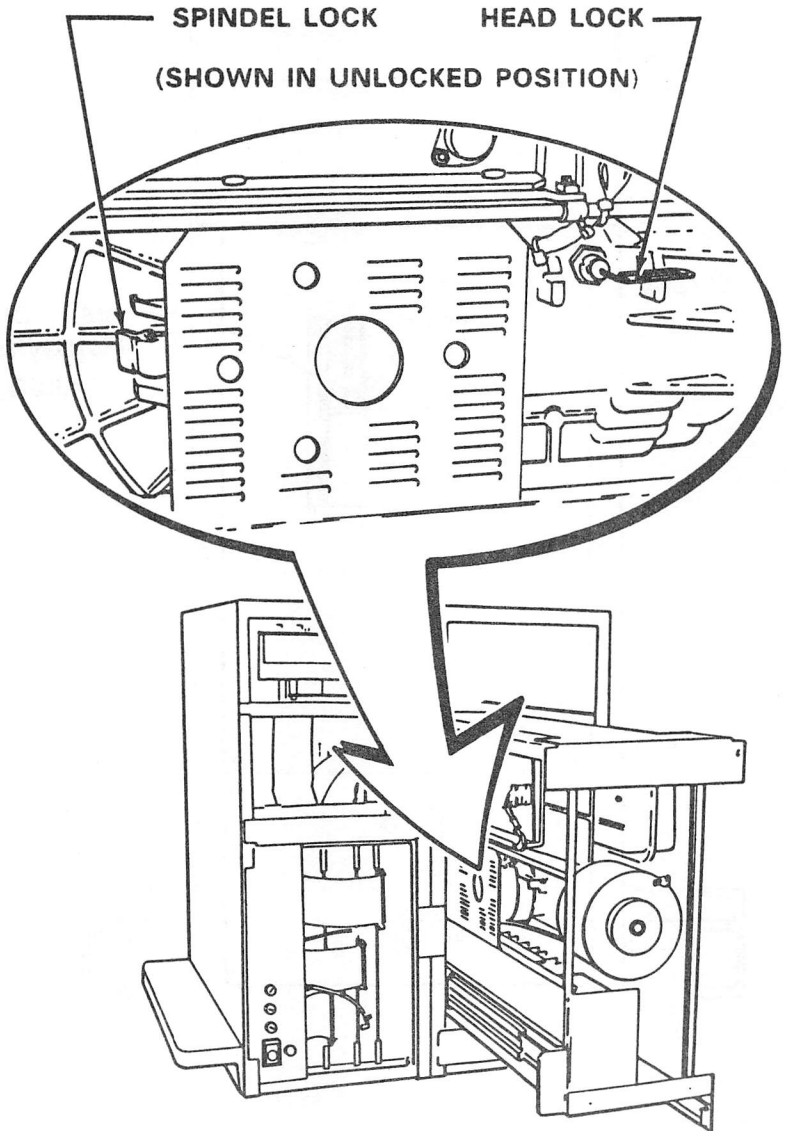
Figure 8-2

**Unlocking 14" Hard Disks
(1-lock model)**

DISK LOCK
(SHOWN IN
LOCKED POSTION)
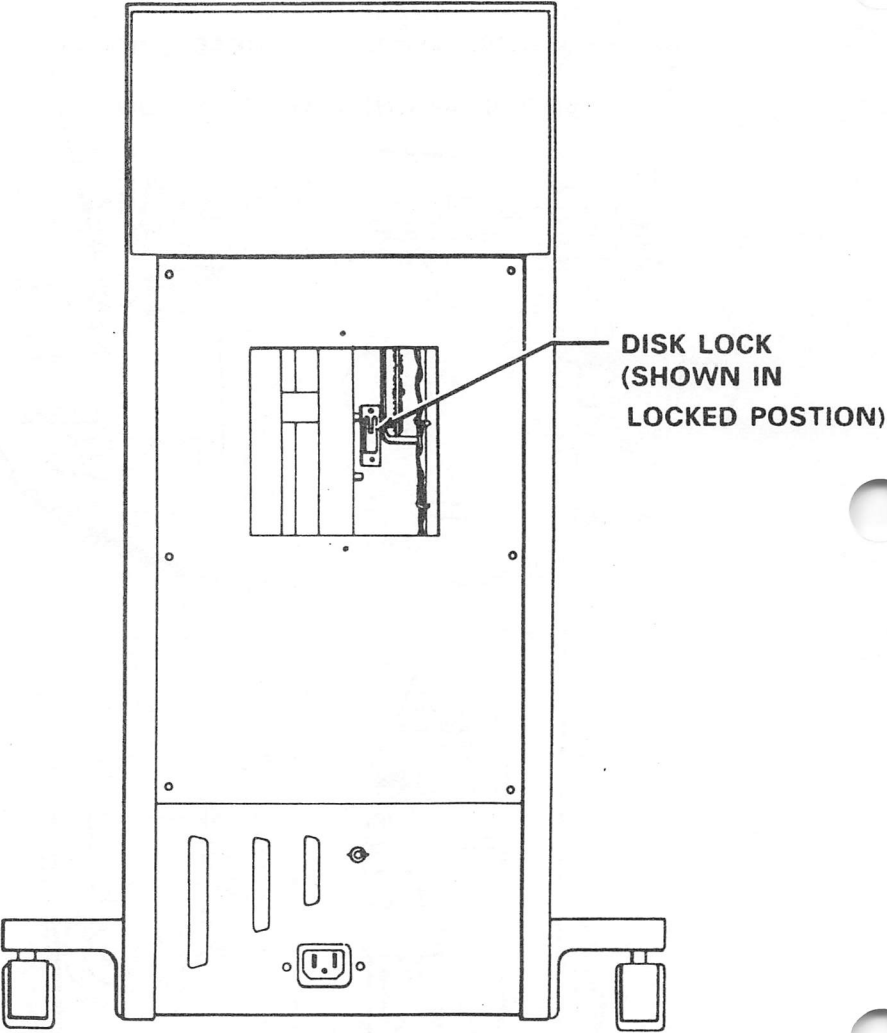
Figure 8-3

Unlocking 8" Hard Disks
(1-lock model)

**DISK LOCK
(SHOWN IN
LOCKED
POSITION)**
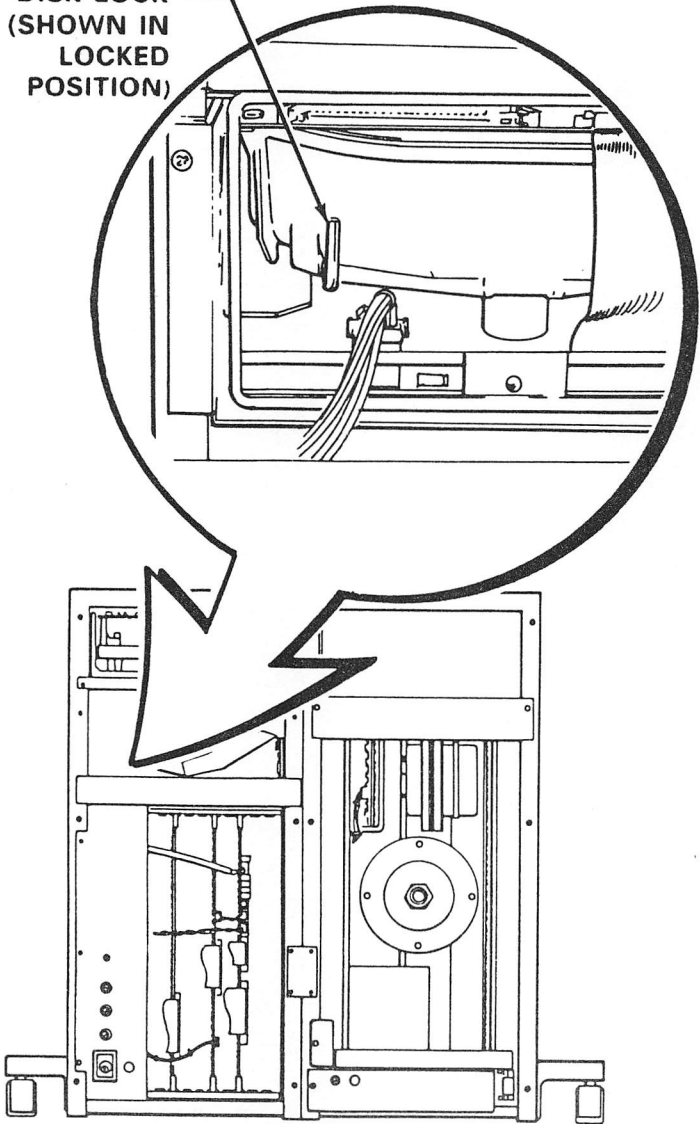
Chapter 9

Installing the NIC

9.0 Introduction

Detailed information regarding installing the network interface card (NIC) is presented in this chapter; there is reference to this subject in the *Quick Reference Guides* (for the PLAN 3000, 4000, 5000).

9.1 Procedure

For each workstation on your network, follow the installation instructions provided by the manufacturer and then:

(1) Insert the NIC in the proper computer slot (see Section 9.2 and 9.3 for specific information).

   Warning: Never insert cards into a host machine if the power is on.

(2) Connect one end of a length of network cable to a HUB port on an active network.

(3) Connect the other end of the cable to the connector on the bracket on the rear of the user station.

NICs connect to the network via a twisted pair cable from the NIC to the connector on a bracket on the back of the workstation.

To connect the NIC to the network, once the card has been inserted in the appropriate slot:

(1) Attach the bracket with the twisted pair cable attached to it, to the back of the workstation.

(2) Plug the twisted pair cable into the polarized 3-pin socket on the NIC board.

(3) Connect the network cable to the connector on the bracket.

9.2 IBM PC

The NIC for the IBM PC can be installed in any vacant expansion slot (see Figure 11-1). Connection to the network is made using the connector on the backplate of the NIC.

If your IBM PC is populated with other cards, any of which use interrupt 2 or address range D2000 - D3FFF, see Chapter 6.

There are two lights on the IBM NIC's network cabling bracket. The upper light (green) when lit, signifies NIC transmissions although the light is also lit when the workstation is disconnected from the network. When the workstation is properly connected to the network, the light will be on (though varying in intensity with a flicker). It should not be flashing. When the network is reconfiguring, light activity will vary from 1.5 Hz flash to a 1.5 kHz flicker, with the light generally on.

The bottom light (red) signifies workstation NIC access and will only be lit when network software is executing in the NIC address space. This light may not be lit steadily but will flash to indicate workstation/network communication.

The following parameters can be configured on the card: station address (set by shunt or switch), memory address (set to D2000 hex), and IRQ line (set to IRQ 2).

Figure 9-1

Installing the IBM PC and AT NIC
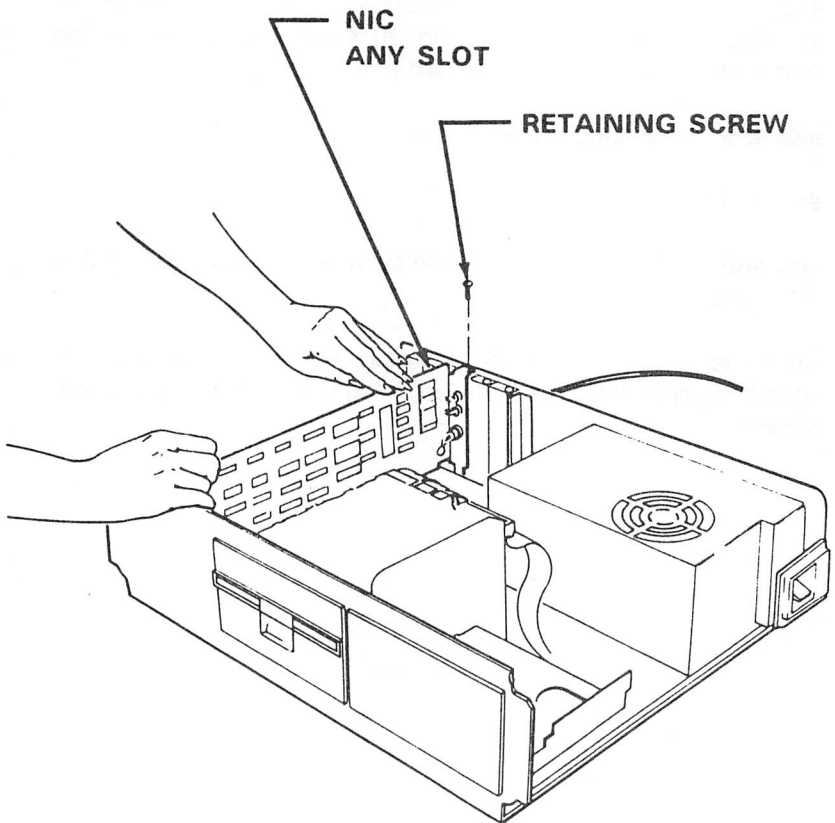
9.3 Apple // and Apple //e

Do normal hardware installation as described in the appropriate Apple manuals. Recommended use of the Apple expansion slots are as follows:

slot 0 - 16 K language card if Apple Pascal or CP/M to be used (not used with Apple //e since it is built in).

slot 1 - local printer controller card.

slot 3 - 80 column video card (M&R, ALS, VIDEX). Instructions in video card booklet. (Use the 80 column card slot for the Apple //e's special 80 column card.)

slot 4, 5 - local floppy controller.

slot 6 - Network Interface Card.

any slot - Z-80 card if CP/M is to be used (do not use slot 3 in the Apple //e).

An Apple // can communicate directly with more than one network if multiple NICs are installed, each connected to a different network.

Figure 9-2

Installing the Apple NIC

PLUG IN

NIC

TO NETWORK

SLOT 6
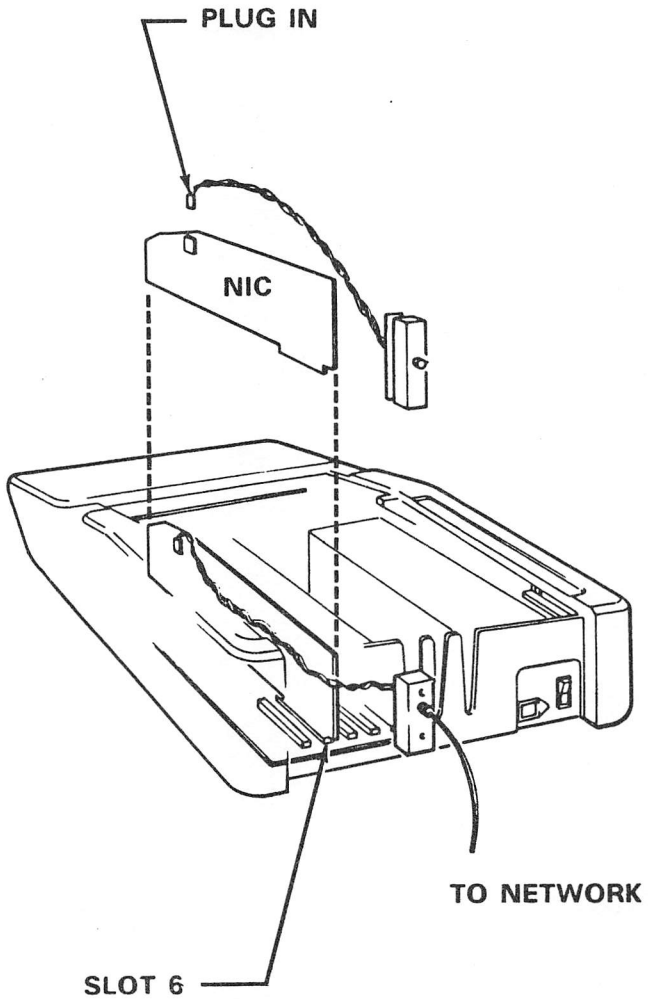
Appendix A

Decimal/Hexadecimal/Binary Conversion

DECIMAL	HEXADECIMAL	BINARY BIT
		7 6 5 4 3 2 1 0
1	$01	0 0 0 0 0 0 0 1
2	$02	0 0 0 0 0 0 1 0
3	$03	0 0 0 0 0 0 1 1
4	$04	0 0 0 0 0 1 0 0
5	$05	0 0 0 0 0 1 0 1
6	$06	0 0 0 0 0 1 1 0
7	$07	0 0 0 0 0 1 1 1
8	$08	0 0 0 0 1 0 0 0
9	$09	0 0 0 0 1 0 0 1
10	$0A	0 0 0 0 1 0 1 0
11	$0B	0 0 0 0 1 0 1 1
12	$0C	0 0 0 0 1 1 0 0
13	$0D	0 0 0 0 1 1 0 1
14	$0E	0 0 0 0 1 1 1 0
15	$0F	0 0 0 0 1 1 1 1
16	$10	0 0 0 1 0 0 0 0
17	$11	0 0 0 1 0 0 0 1
18	$12	0 0 0 1 0 0 1 0
19	$12	0 0 0 1 0 0 1 1
20	$14	0 0 0 1 0 1 0 0
21	$15	0 0 0 1 0 1 0 1
22	$16	0 0 0 1 0 1 1 0
23	$17	0 0 0 1 0 1 1 1
24	$18	0 0 0 1 1 0 0 0
25	$19	0 0 0 1 1 0 0 1
26	$1A	0 0 0 1 1 0 1 0
27	$1B	0 0 0 1 1 0 1 1
28	$1C	0 0 0 1 1 1 0 0
29	$1D	0 0 0 1 1 1 0 1
30	$1E	0 0 0 1 1 1 1 0
31	$1F	0 0 0 1 1 1 1 1
32	$20	0 0 1 0 0 0 0 0

DECIMAL	HEXADECIMAL	BINARY BIT
		7 6 5 4 3 2 1 0
33	$21	0 0 1 0 0 0 0 1
34	$22	0 0 1 0 0 0 1 0
35	$23	0 0 1 0 0 0 1 1
36	$24	0 0 1 0 0 1 0 0
37	$25	0 0 1 0 0 1 0 1
38	$26	0 0 1 0 0 1 1 0
39	$27	0 0 1 0 0 1 1 1
40	$28	0 0 1 0 1 0 0 0
41	$29	0 0 1 0 1 0 0 1
42	$2A	0 0 1 0 1 0 1 0
43	$2B	0 0 1 0 1 0 1 1
44	$2C	0 0 1 0 1 1 0 0
45	$2D	0 0 1 0 1 1 0 1
46	$2E	0 0 1 0 1 1 1 0
47	$2F	0 0 1 0 1 1 1 1
48	$30	0 0 1 1 0 0 0 0
49	$31	0 0 1 1 0 0 0 1
50	$32	0 0 1 1 0 0 1 0
51	$33	0 0 1 1 0 0 1 1
52	$34	0 0 1 1 0 1 0 0
53	$35	0 0 1 1 0 1 0 1
54	$36	0 0 1 1 0 1 1 0
55	$37	0 0 1 1 0 1 1 1
56	$38	0 0 1 1 1 0 0 0
57	$39	0 0 1 1 1 0 0 1
58	$3A	0 0 1 1 1 0 1 0
59	$3B	0 0 1 1 1 0 1 1
60	$3C	0 0 1 1 1 1 0 0
61	$3D	0 0 1 1 1 1 0 1
62	$3E	0 0 1 1 1 1 1 0
63	$3F	0 0 1 1 1 1 1 1
64	$40	0 1 0 0 0 0 0 0
65	$41	0 1 0 0 0 0 0 1
66	$42	0 1 0 0 0 0 1 0
67	$43	0 1 0 0 0 0 1 1
68	$44	0 1 0 0 0 1 0 0
69	$45	0 1 0 0 0 1 0 1

DECIMAL	HEXADECIMAL	BINARY BIT
		7 6 5 4 3 2 1 0
70	$46	0 1 0 0 0 1 1 0
71	$47	0 1 0 0 0 1 1 1
72	$48	0 1 0 0 1 0 0 0
73	$49	0 1 0 0 1 0 0 1
74	$4A	0 1 0 0 1 0 1 0
75	$4B	0 1 0 0 1 0 1 1
76	$4C	0 1 0 0 1 1 0 0
77	$4D	0 1 0 0 1 1 0 1
78	$4E	0 1 0 0 1 1 1 0
79	$4F	0 1 0 0 1 1 1 1
80	$50	0 1 0 1 0 0 0 0
81	$51	0 1 0 1 0 0 0 1
82	$52	0 1 0 1 0 0 1 0
83	$53	0 1 0 1 0 0 1 1
84	$54	0 1 0 1 0 1 0 0
85	$55	0 1 0 1 0 1 0 1
86	$56	0 1 0 1 0 1 1 0
87	$57	0 1 0 1 0 1 1 1
88	$58	0 1 0 1 1 0 0 0
89	$59	0 1 0 1 1 0 0 1
90	$5A	0 1 0 1 1 0 1 0
91	$5B	0 1 0 1 1 0 1 1
92	$5C	0 1 0 1 1 1 0 0
93	$5D	0 1 0 1 1 1 0 1
94	$5E	0 1 0 1 1 1 1 0
95	$5F	0 1 0 1 1 1 1 1
96	$60	0 1 1 0 0 0 0 0
97	$61	0 1 1 0 0 0 0 1
98	$62	0 1 1 0 0 0 1 0
99	$63	0 1 1 0 0 0 1 1
100	$64	0 1 1 0 0 1 0 0
101	$65	0 1 1 0 0 1 0 1
102	$66	0 1 1 0 0 1 1 0
103	$67	0 1 1 0 0 1 1 1
104	$68	0 1 1 0 1 0 0 0
105	$69	0 1 1 0 1 0 0 1
106	$6A	0 1 1 0 1 0 1 0

DECIMAL	HEXADECIMAL	BINARY BIT
		7 6 5 4 3 2 1 0
107	$6B	0 1 1 0 1 0 1 1
108	$6C	0 1 1 0 1 1 0 0
109	$6D	0 1 1 0 1 1 0 1
110	$6E	0 1 1 0 1 1 1 0
111	$6F	0 1 1 0 1 1 1 1
112	$70	0 1 1 1 0 0 0 0
113	$71	0 1 1 1 0 0 0 1
114	$72	0 1 1 1 0 0 1 0
115	$73	0 1 1 1 0 0 1 1
116	$74	0 1 1 1 0 1 0 0
117	$75	0 1 1 1 0 1 0 1
118	$76	0 1 1 1 0 1 1 0
119	$77	0 1 1 1 0 1 1 1
120	$78	0 1 1 1 1 0 0 0
121	$79	0 1 1 1 1 0 0 1
122	$7A	0 1 1 1 1 0 1 0
123	$7B	0 1 1 1 1 0 1 1
124	$7C	0 1 1 1 1 1 0 0
125	$7D	0 1 1 1 1 1 0 1
126	$7E	0 1 1 1 1 1 1 0
127	$7F	0 1 1 1 1 1 1 1

Appendix B

Station Address Reference List

STN ADD (DEC)	STN ADD (HEX)	CABLE ID & TYPE	LOCATION	USER
1 ___	$01			
2 ___	$02			
3 ___	$03			
4 ___	$04			
5 ___	$05			
6 ___	$06			
7 ___	$07			
8 ___	$08			
9 ___	$09			
10 ___	$0A			
11 ___	$0B			
12 ___	$0C			
13 ___	$0D			
14 ___	$0C			
15 ___	$0D			
16 ___	$0E			
17 ___	$0F			
18 ___	$10			
19 ___	$11			
20 ___	$12			
21 ___	$13			
22 ___	$14			
23 ___	$15			
24 ___	$16			
25 ___	$17			
26 ___	$18			
27 ___	$19			
28 ___	$2A			
29 ___	$2B			
30 ___	$2C			
31 ___	$1F			
32 ___	$20			

REFERENCE LIST

STN ADD (DEC)	STN ADD (HEX)	CABLE ID & TYPE	LOCATION	USER
33 ___	$21			
34 ___	$22			
35 ___	$23			
36 ___	$24			
37 ___	$25			
38 ___	$26			
39 ___	$27			
40 ___	$28			
41 ___	$29			
42 ___	$2A			
43 ___	$2B			
44 ___	$2C			
45 ___	$2D			
46 ___	$2E			
47 ___	$2F			
48 ___	$30			
49 ___	$31			
50 ___	$32			
51 ___	$33			
52 ___	$34			
53 ___	$35			
54 ___	$36			
55 ___	$37			
56 ___	$38			
57 ___	$39			
58 ___	$3A			
59 ___	$3B			
60 ___	$3C			
61 ___	$3D			
62 ___	$3E			
63 ___	$3F			
64 ___	$40			
65 ___	$41			
66 ___	$42			
67 ___	$43			
68 ___	$44			

STN ADD (DEC)	STN ADD (HEX)	CABLE ID & TYPE	LOCATION	USER
69 ___	$45			
70 ___	$46			
71 ___	$47			
72 ___	$48			
73 ___	$49			
74 ___	$4A			
75 ___	$4B			
76 ___	$4C			
77 ___	$4D			
78 ___	$4E			
79 ___	$4F			
80 ___	$50			
81 ___	$51			
82 ___	$52			
83 ___	$53			
84 ___	$54			
85 ___	$55			
86 ___	$56			
87 ___	$57			
88 ___	$58			
89 ___	$59			
90 ___	$5A			
91 ___	$5B			
92 ___	$5C			
9S ___	$5D			
94 ___	$5E			
95 ___	$5F			
96 ___	$60			
97 ___	$61			
98 ___	$62			
99 ___	$63			
100 ___	$64			
101 ___	$65			
102 ___	$66			
103 ___	$67			
104 ___	$68			
105 ___	$69			

STN ADD (DEC)	STN ADD (HEX)	CABLE ID & TYPE	LOCATION	USER
106 ___	$6A			
107 ___	$6B			
108 ___	$6C			
109 ___	$6D			
110 ___	$6E			
111 ___	$6F			
112 ___	$70			
113 ___	$71			
114 ___	$72			
115 ___	$73			
116 ___	$74			
117 ___	$75			
118 ___	$76			
119 ___	$77			
120 ___	$78			
121 ___	$79			
122 ___	$7A			
123 ___	$7B			
124 ___	$7C			
125 ___	$7D			
126 ___	$7E			
127 ___	$7F			
128 ___	$80			
129 ___	$81			
130 ___	$82			
131 ___	$83			
132 ___	$84			
133 ___	$85			
134 ___	$86			
135 ___	$87			
136 ___	$88			
137 ___	$89			
138 ___	$8A			
139 ___	$8B			
140 ___	$8C			
141 ___	$8D			
142 ___	$8E			

STN ADD (DEC)	STN ADD (HEX)	CABLE ID & TYPE	LOCATION	USER
143 ___	$8F			
144 ___	$90			
145 ___	$91			
146 ___	$92			
147 ___	$93			
148 ___	$94			
149 ___	$95			
150 ___	$96			
151 ___	$97			
152 ___	$98			
153 ___	$99			
154 ___	$9A			
155 ___	$9B			
156 ___	$9C			
157 ___	$9D			
158 ___	$9E			
159 ___	$9F			
160 ___	$A0			
161 ___	$A1			
162 ___	$A2			
163 ___	$A3			
164 ___	$A4			
165 ___	$A5			
166 ___	$A6			
167 ___	$A7			
168 ___	$A8			
169 ___	$A9			
170 ___	$AA			
171 ___	$AB			
172 ___	$AC			
173 ___	$AD			
174 ___	$AE			
175 ___	$AF			
176 ___	$B0			
177 ___	$B1			
178 ___	$B2			
179 ___	$B3			

REFERENCE LIST

STN ADD (DEC)	STN ADD (HEX)	CABLE ID & TYPE	LOCATION	USER
180 ___	$B4			
181 ___	$B5			
182 ___	$B6			
183 ___	$B7			
184 ___	$B8			
185 ___	$B9			
186 ___	$BA			
187 ___	$BB			
188 ___	$BC			
189 ___	$BD			
190 ___	$BE			
191 ___	$BF			
192 ___	$C0			
193 ___	$C1			
194 ___	$C2			
195 ___	$C3			
196 ___	$C4			
197 ___	$C5			
198 ___	$C6			
199 ___	$C7			
200 ___	$C8			
201 ___	$C9			
202 ___	$CA			
203 ___	$CB			
204 ___	$CC			
205 ___	$CD			
206 ___	$CE			
207 ___	$CF			
208 ___	$D0			
209 ___	$D1			
210 ___	$D2			
211 ___	$D3			
212 ___	$D4			
213 ___	$D5			
214 ___	$D6			
215 ___	$D7			
216 ___	$D8			
217 ___	$D9			

STN ADD (DEC)	STN ADD (HEX)	CABLE ID & TYPE	LOCATION	USER
218 ___	$DA			
219 ___	$DB			
220 ___	$DC			
221 ___	$DD			
222 ___	$DE			
223 ___	$DF			
224 ___	$E0			
225 ___	$E1			
226 ___	$E2			
227 ___	$E3			
228 ___	$E4			
229 ___	$E5			
230 ___	$E6			
231 ___	$E7			
232 ___	$E8			
233 ___	$E9			
234 ___	$EA			
235 ___	$EB			
236 ___	$EC			
237 ___	$ED			
238 ___	$EE			
239 ___	$EF			
240 ___	$F0			
241 ___	$F1			
242 ___	$F2			
243 ___	$F3			
244 ___	$F4			
245 ___	$F5			
246 ___	$F6			
247 ___	$F7			
248 ___	$F8			
249 ___	$F9			
250 ___	$FA			
251 ___	$FB			
252 ___	$FC			
253 ___	$FD			
254 ___	$FE			
255 ___	$FF			

Appendix C

Propagation Delays

When laying out your network, calculate the propagation time and cable lengths between the workstations that are the farthest away from each other (in terms of cable lengths and intervening HUBs).

Note· Maximum allowed propagation time between any two stations is 31 microseconds.

To calculate propagation time, use the following formula:

Prop. time = total length of tp cable (ft) x .0013
    + total length of coax (ft) x .00121
    + total length of optic cable (ft) x .00154
    + # of coax/tp HUBs x .3
    + # of fiber optic HUBs* x .5

A HUB connecting a fiber optic cable at one port and a coax or tp cable at another port is counted as a fiber optic HUB.

Table C-1

Maximum Allowed Cable Length

	Coax	Twisted Pair	Fiber Optic
Between Stations & HUB	2,000'	1,650'	4,000'
Between stations (with intervening HUBs)	22,000'	20,000'	17,000'

Table E-1

Calculation of Propagation Delay

From Stn	To Stn	Total Coax (feet)	(x.00121)	Total TP (feet)	(x.003)	Total Fiber (feet)	(x.00154)	Coax/TP HUBs	(x.3)	Fiber Optic HUBs	(x.5)	Total Propagation Time
			+		+		+		+		=	
			+		+		+		+		=	
			+		+		+		+		=	
			+		+		+		+		=	
			+		+		+		+		=	

C-2

Appendix D

Disk Capacity Planning

Network software requires disk space as indicated in the following tables.

  * 1 Sector = 256 bytes
  ** 1 Megabyte = 1,024 x 1,024 bytes = 1,048,976 bytes

Table D-1

Network Software
Disk Space Requirements

Item	Disk Space (Sectors)	(Megabytes)
File Server Program	5,688	1.398
Menus, Profiles	418	0.104
PlanPak II	14,646	3.661
Boot	350	0.087
User Station Support	23,024	5.756
IBM PC DOS	4,607	1.151
IBM p-System	4,010	1.002
Apple // Pascal	3,610	0.902
Apple // CP/M	8,247	2.061
Apple // DOS	567	0.144
Apple /// SOS	2,007	0.501
Print Server	6,420	1.605
Messenger	2,101	0.526
Apple // FTS	3,285	0.821
SNA	4,335	1.084
TOTAL SYSTEM	83,315	20.803

Table D-2

IBM PC Local Memory Network Requirements

Item	Disk Space	
	(Sectors)	(Megabytes)
Driver	84	0.029
NETTEMP.SYS	62	0.015
PLANPak II	1,000	0.245

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